



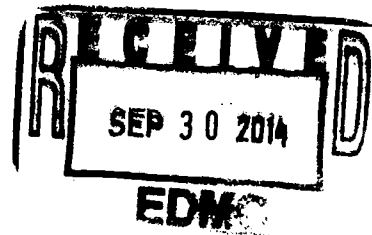
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14-AMRP-0299

SEP 24 2014

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Addressees:

GROUNDWATER SAMPLING AND ANALYSIS PLAN FOR THE 200-PO-1
GROUNDWATER OPERABLE UNIT, DOE/RL-2014-31, DRAFT A

This letter transmits the Groundwater Sampling and Analysis Plan (SAP) for the 200-PO-1 Groundwater Operable Unit, DOE/RL-2014-31, Draft A, for your review. The technical rationale and approach used to develop this SAP was discussed in meetings with State of Washington Department of Ecology staff on August 18, 2014, and September 9, 2014, in Richland, Washington. This document supports the 200-PO-1 Remedial Investigation Report, DOE/RL-2009-85 and presents routine sampling and analytical requirements for groundwater monitoring wells located within the Operable Unit.

Please provide your comments within 45 days of receipt.

Addressees
14-AMRP-0299

-2-

SEP 24 2014

If you have any questions, please contact me, or your staff may contact, Briant Charboneau, of my staff, on (509) 373-6137.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ray J. Corey', with a stylized, looping flourish at the end.

Ray J. Corey, Assistant Manager
for the River and Plateau

AMRP:NMJ

Attachment

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Groundwater Sampling and Analysis Plan for the 200-PO-1 Groundwater Operable Unit

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

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Groundwater Sampling and Analysis Plan for the 200-PO-1 Groundwater Operable Unit

Project No: 200-PO-1

Document Type: PLAN

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Date Published
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Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
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APPROVED

By Lee Ann Snyder at 9:59 am, Jul 14, 2014

Release Approval

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Terms

AEA	<i>Atomic Energy Act of 1954</i>
ALARA	as low as reasonably achievable
ASTM	American Society for Testing and Materials
BRA	baseline risk assessment
BTR	Buyer's Technical Representative
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
CFR	<i>Code of Federal Regulations</i>
CN	Change Notice
COC	contaminant of concern
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
DOE-RL	DOE Richland Operations Office
DOT	U.S. Department of Transportation
DQA	data quality assessment
DQI	data quality indicator
DQO	data quality objective
DUP	field duplicate sample
DWS	drinking water standard
EB	equipment blank
ECO	Environmental Compliance Officer
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FFTF	Fast Flux Test Facility
FS	feasibility study
FSO	Field Sampling Operations
FTB	full trip blank
FWS	Field Work Supervisor
FXR	field transfer blank

FY	fiscal year
GPC	gas proportional counting
HASQARD	<i>Hanford Analytical Services Quality Assurance Requirements Documents</i>
HEIS	Hanford Environmental Information System
IC	ion chromatography
IDF	Integrated Disposal Facility
LCS	laboratory control sample
LMU	Lower Mud Unit
LRA	lead regulatory agency
MB	method blank
MCL	maximum contaminant level
MDC	minimum detectable concentration
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NCO	nuclear chemical operator
NRDWL	Nonradioactive Dangerous Waste Landfill
OU	operable unit
PNNL	Pacific Northwest National Laboratory
PPE	personal protective equipment
PUREX	Plutonium-Uranium Extraction (Plant)
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
RAWP	remedial action work plan
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RCT	radiological control technician
RDR	request for data review
REDOX	Reduction-Oxidation (Plant)

RI	remedial investigation
ROD	record of decision
RPD	relative percent difference
SAF	Sample Authorization Form
SAP	sampling and analysis plan
SIM	soil inventory model
SMILE	<i>Sample Management Integrated Lifecycle Environment</i>
SMR	Sample Management and Reporting
SPLIT	field split sample
SUR	surrogate
SWL	Solid Waste Landfill
TEDF	Treated Effluent Disposal Facility
Tri-Party Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
TPA	Tri-Party Agreement
TSD	treatment, storage, and disposal
WAC	<i>Washington Administrative Code</i>
WMA	Waste Management Area

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1 Purpose

This sampling and analysis plan (SAP) presents the groundwater monitoring program for the 200-PO-1 Groundwater Operable Unit (OU). The 200-PO-1 Groundwater OU is the largest groundwater OU associated with the Hanford Site (Figure 1-1). The OU encompasses the southern part of the 200 East Area and a large portion of the southeastern Hanford Site. It extends from the 200-BP-5 OU to the north to the Hanford Town Site to the east and the 300-FF-5 Groundwater OU to the southeast. The purpose of the SAP is to define routine sampling and analytical requirements for groundwater monitoring wells located within the OU. In 2012, the 200-PO-1 OU Remedial Investigation (RI) Report (DOE/RL-2009-85, *Remedial Investigation Report for the 200-PO-1 Groundwater Operable Unit*) was completed. The monitoring program defined in this plan reflects that the OU is in the post-RI period and will be used to direct *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) routine groundwater monitoring activities until a remedial action decision is made for the OU.

This SAP supersedes the following previous CERCLA groundwater sampling and analysis documents for the OU:

- DOE/RL-2003-04, Sampling and Analysis Plan for the 200-PO-1 Groundwater Operable Unit
- DOE/RL-2007-31, Remedial Investigation/Feasibility Study Work Plan for the 200-PO-1 Groundwater Operable Unit
- TPA-CN-205, Change Notice for Modifying Approved Documents/Workplans In Accordance with the Tri-Party Agreement Action Plan, Section 9.0, Documentation and Records: DOE/RL-2003-4, Revision 1, Sampling and Analysis Plan for the 200-PO-1 Operable Unit
- TPA-CN-2-253, Change Notice for Modifying Approved Documents/Workplans In Accordance with the Tri-Party Agreement Action Plan, Section 9.0, Documentation and Records: DOE/RL-2007-31 Rev 0, Remedial Investigation/Feasibility Study Work Plan for the 200-PO-1 Operable Unit

This plan also integrates CERCLA and site-wide surveillance (*Atomic Energy Act of 1954* [AEA]) groundwater monitoring programs by incorporating AEA sampling requirements. Groundwater monitoring under AEA is implemented primarily through DOE O 435.1, *Radioactive Waste Management*. Through the AEA, the U.S. Department of Energy (DOE) regulates control of radioactive materials under its authority. DOE determines the frequency and location of groundwater monitoring for radionuclides according to standards established to protect human health and the environment from potential radioactive material risks.

This SAP consists of five chapters with the remainder of this section addressing the project scope and objectives, background, data quality objectives (DQOs), contaminants of potential concern (COPCs), and project schedule. Chapter 2 discusses quality assurance (QA) requirements. Chapter 3 provides the field sampling plan. Chapters 4 and 5 address waste management and health and safety requirements.

1.1 Project Scope and Objectives

The objectives of this SAP are the following:

- Monitor changes in the extent and rate of movement of groundwater plumes within the unconfined aquifer by collecting and analyzing groundwater samples for specific COPCs at selected well locations within the OU.
- Incorporate AEA sampling requirements.

AEA groundwater monitoring needs are met, in general, through the performance of CERCLA monitoring activities. For some waste-site specific cases, AEA groundwater monitoring requirements have been established in specific plans. For the 200-PO-1 OU, the following monitoring plan has AEA requirements, which are incorporated into this SAP for integration purposes:

- PNNL-15315, *RCRA Assessment Plan for Single-Shell Tank Waste Management Area A-AX at the Hanford Site*; AEA monitoring for technetium-99 is specified as quarterly at Waste Management Area (WMA) A/AX. As this document is revised, the 200-PO-1 SAP will be adjusted accordingly.

Water level monitoring data needed for the 200-PO-1 OU is collected under SGW-38815, *Water-Level Monitoring Plan for the Hanford Site Soil and Groundwater Remediation Project*. Supplemental measurements are also performed as described in SGW-54165, *Evaluation of the Unconfined Aquifer Hydraulic Gradient Beneath the 200 East Area, Hanford Site*, utilizing a more accurate measurement methodology from selected wells to assist in determining local flow conditions in the 200 East Area. As a result, water level data collection is not part of the scope of this SAP.

Groundwater monitoring of the basalt-confined aquifer is not within the scope of this SAP. However, monitoring specifications for the upper basalt confined aquifer are addressed in DOE/RL-2012-59, *Sampling and Analysis Plan for Groundwater Surveillance Monitoring on the Hanford Site*, issued in October 2013. These additional monitoring elements are collectively termed “surveillance” groundwater monitoring. Six of the wells identified as part of this basalt confined-aquifer monitoring plan are located within the 200-PO-1 OU boundary.

The COPC screening completed for the RI baseline risk assessment (BRA) identified eight contaminants in groundwater within this OU that met the criteria of final COPCs, utilizing a data set collected between January 2004 and March 2009 (DOE/RL-2009-85). Three distinct exposure areas were defined for the analysis: a Near Field area (in the general vicinity of the apparent contaminant source areas within the 200 East Area), a Far Field area (in the generally undeveloped downgradient area between the 200 East Area and the Columbia River), and a River area (located generally within 1 km [0.6 mi] of the west shore of the Columbia River). The COPCs identified included uranium, iodine-129, strontium-90, technetium-99, tritium, nitrate, trichloroethene, and tetrachloroethene. This COPC list has been further refined as the result of a recent supplemental RI groundwater evaluation based on six years of data considered representative of current groundwater conditions (samples collected between January 2008 and January 2014). The recent BRA analysis confirmed six of the previous eight constituents as COPCs. Trichloroethene and tetrachloroethene, which had previously been detected in only a few isolated locations, were not identified as COPCs in the analysis completed using more current data.

The 200-PO-1 OU COPCs occur in plumes that cover relatively large areas (major plume) and relatively small areas (minor plume). The major COPC plumes consist of iodine-129, nitrate, and tritium. The minor plumes include strontium-90, technetium-99, and uranium. The iodine-129 and tritium plumes extend beyond the 200 East Area boundary towards the Columbia River. General plume characteristics impacting the sampling design include the following:

- Because of slow migration characteristics, the extent and shape of the iodine-129 and strontium-90 plumes have remained relatively consistent over the last decade.
- The tritium plume has attenuated in the Far Field area and decreased in extent over the last decade. The overall plume has decreased in size approximately 44 percent since 1996.
- The nitrate plume currently only occurs in the Near Field area.

1 • Available sampling results collected since 2007 indicate that the uranium plume is stable and has had
2 a relatively consistent extent limited to a relatively small area around the Plutonium-Uranium
3 Extraction (PUREX) cribs.

4 • The general extent of the technetium plume has been consistent over the last decade and has been
5 delineated within a small area adjacent to the southeast corner of WMA A/AX tank farm.

6 Contaminant plumes that could encroach into the 200-PO-1 OU area from the west (e.g., chromium,
7 tritium, and iodine) are being monitored by the adjacent 200-UP-1 OU. These plumes are not part of the
8 scope of this SAP. The 200-PO-1 OU monitoring network is not monitoring or tracking contaminant
9 plumes that are associated with other OUs.

10 Both CERCLA and AEA groundwater monitoring requirements for the 200-PO-1 OU are addressed by
11 this new SAP. Programmatic requirements for other sampling within the 200-PO-1 area (e.g., *Resource*
12 *Conservation and Recovery Act of 1976* [RCRA]) will continue to be performed pursuant to other
13 sampling plans, and those requirements are not be included in this SAP.

14 As part of the DQOs process, historical sampling locations and analytical results generated from the
15 200-PO-1 OU monitoring network for the period from 2007 through 2013 were reviewed in conjunction
16 with development of this SAP. The locations of monitoring wells with respect to the 2012 plume
17 configurations were analyzed with the objective of optimizing the current well network and sampling
18 requirements. The analysis was directed at defining those wells needed for contaminant monitoring and
19 determination of an appropriate sampling frequency. The criteria applied to identify the wells needed for
20 monitoring of contaminant conditions and the selection of an appropriate sampling frequency are
21 provided in Appendix A.

22 Table 1-1 and the following discussion identify the documents that currently have sampling requirements
23 associated with the 200-PO-1 OU. Two primary SAPs (DOE/RL-2003-04; DOE/RL-2007-31) and two
24 subordinate SAPs (DOE/RL-2012-59; DOE/RL-2002-11, *300-FF-5 Operable Unit Sampling and*
25 *Analysis Plan*) include CERCLA and AEA monitoring requirements for selected wells within the 200-
26 PO-1 OU. These documents contain overlapping and duplicated sampling requirements for the 200-PO-1
27 OU. Table 1-1 provides an overview of the sampling plans currently addressing groundwater monitoring
28 within the 200-PO-1 OU and identifies how this new SAP addresses the overlap. Documents associated
29 with monitoring groundwater conditions in the 200-PO-1 OU are discussed in the following paragraphs.

30 DOE/RL-2003-04 is used to provide the groundwater data necessary to track contaminant plumes in the
31 200-PO-1 OU. The data generated support the CERCLA RI/feasibility study (FS) process and site-wide
32 surveillance monitoring under AEA. The routine monitoring performed through implementation of
33 DOE/RL-2003-04, which is conducted under the Hanford Groundwater Monitoring program in
34 fulfillment of CERCLA and AEA requirements, is ongoing. The sampling and laboratory analyses needed
35 to complete the RI phase for 200-PO-1 OU were specified in the work plan SAP (DOE/RL-2007-31,
36 Appendix A). The work plan RI SAP was designed to complement the routine groundwater monitoring
37 SAP (DOE/RL-2003-04) and yielded new information regarding groundwater flow rates, preferential
38 pathways for contaminant migration, contaminant mass transport, and environmental risk. The RI
39 characterization activities have been completed, and the RI report was issued in October 2012
40 (DOE/RL-2009-85).

41 Two Tri-Party Agreement (TPA) (Ecology et al., 1989a, *Hanford Federal Facility Agreement and*
42 *Consent Order*) Change Notices (CNs) have been issued that direct the majority of the current 200-PO-1
43 OU groundwater monitoring activities. TPA-CN-205, issued in June 2008, specifies changes to the well
44 network, analytical requirements, and frequencies previously identified in DOE/RL-2003-04.

TPA-CN-2-253, issued in January 2009, identifies changes to monitoring requirements presented in DOE/RL-2007-31. TPA-CN-2-253 removed the Phase II RI activities. The TPA-CN indicated that groundwater monitoring conducted under the RI work plan SAP would continue until superseded by groundwater monitoring specified in an approved remedial action work plan (RAWP). Sampling and analytical requirements for many of the wells identified in DOE/RL-2007-31, Appendix A, Table A3-2, are identical with those identified in the routine monitoring SAP (DOE/RL-2003-04).

DOE/RL-2012-59, issued in October 2013, includes monitoring specifications of the upper basalt-confined aquifer and the Ringold-confined aquifer. Groundwater within the upper basalt-confined aquifer is monitored because it is a potential pathway for contaminants to move offsite. The confined to semiconfined aquifer within the Ringold Formation Unit A is present beneath most of the Hanford Site. All but 6 of the 44 wells in this network are also sampled for the objectives of the CERCLA OUs. DOE/RL-2012-59 describes the sampling frequencies and analytical requirements for the monitoring wells.

The 300-FF-5 OU SAP (DOE/RL-2002-11) specifies sampling locations (monitoring wells and aquifer tubes), sampling frequency, and analytical requirements for groundwater monitoring within the 300-FF-5 OU. Monitoring focuses on the 300 Area sub-region, the 618-10 Burial Ground/316-4 crib sub-region, and the 618-11 Burial Ground sub-region. Monitoring wells located within the 200-PO-1 OU are also identified as part of the 300-FF-5 OU monitoring network for the 618-11 and 618-10 sub-regions. Because these common wells are associated with monitoring requirements for a 300-FF-5 source area and the 300-FF-5 ROD utilizes these wells for compliance monitoring (DOE/RL-2002-11), they are not included with the wells identified for sampling conducted under this new 200-PO-1 OU SAP.

The monitoring network wells identified in this new SAP are designed to collect groundwater data sufficient to track the extent, movement, and concentration of the COPCs above the drinking water standard (DWS) in the 200-PO-1 Groundwater OU. Implementation of this plan provides routine groundwater monitoring data for use in the Hanford Site groundwater annual report and continuity of data through the RI/FS process. Monitoring under this plan for the six COPCs will continue until a remedial decision is made. The data gathered under this plan help satisfy the requirements of CERCLA (40 CFR 300.430(b), "National Oil and Hazardous Substances Pollution Contingency Plan," "Remedial Investigation/Feasibility Study and Selection of Remedy") and fulfill site-wide surveillance monitoring requirements under AEA, as implemented under DOE O 435.1.

In addition to the CERCLA and AEA monitoring performed within the 200-PO-1 Groundwater OU under this plan, groundwater monitoring is conducted for seven RCRA units located within the boundaries of the OU. These RCRA units include the 216-A-36B Crib, 216-A-37-1 Crib, WMA A-AX (single-shell tanks), 216-A-29 Ditch, 216-B-3 Pond Complex (B Pond), Integrated Disposal Facility (IDF), and Nonradioactive Dangerous Waste Landfill (NRDWL). One other monitored facility, the Solid Waste Landfill (SWL), is not regulated under RCRA but is subject to the *Washington Administrative Code* (WAC). Monitoring data to support RCRA and WAC requirements are collected under separate, site-specific groundwater monitoring plans and are considered supplementary groundwater quality information to the CERCLA OU process.

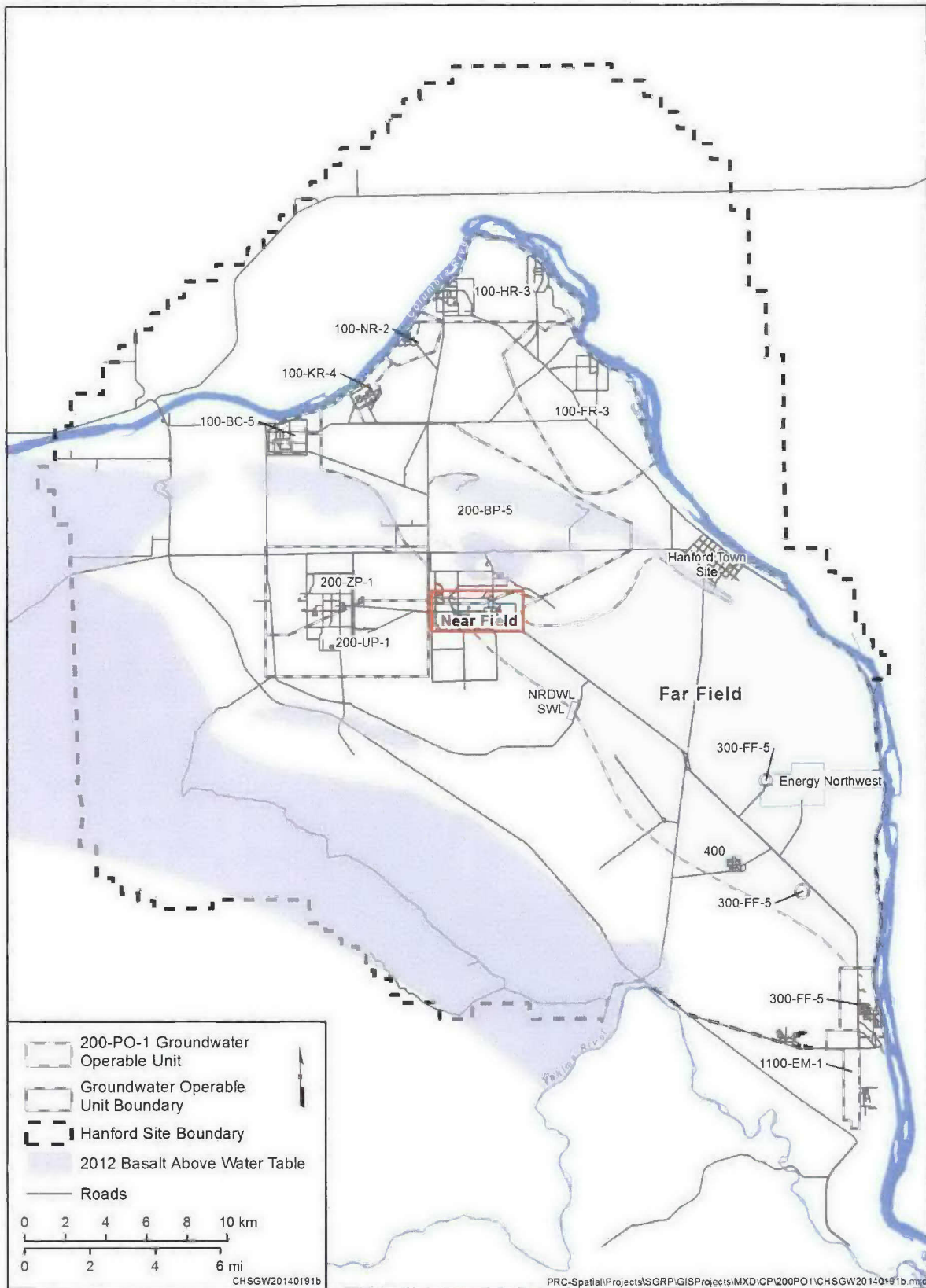


Figure 1-1. 200-PO-1 Groundwater Operable Unit Interest Area Boundaries

Table 1-1. Summary of Sampling Plans with Overlapping Requirements

Document Number	Document Title	Scope	Data Use	New 200-PO-1 SAP
DOE/RL-2003-04 (published August 2005) Modified by TPA-CN-205 (June 2008)	<i>Sampling and Analysis Plan for the 200-PO-1 Ground Water Operable Unit</i>	Provides groundwater data necessary to track the extent and concentration of groundwater contaminant plumes.	Results are reported in the annual Hanford Site Groundwater Report.	Monitoring requirements identified in this new SAP will supersede requirements identified in the previous 200-PO-1 OU groundwater monitoring plan and modifications identified in TPA-CN-205.
DOE/RL-2007-31, Appendix A (published January 2008) Modified by TPA-CN-2-253 (January 2009)	<i>Remedial Investigation/Feasibility Study Work Plan for the 200-PO-1 Groundwater Operable Unit (Appendix A: "Sampling and Analysis Plan for Remedial Investigation and Characterization of the 200-PO-1 Groundwater Operable Unit")</i>	Multi-faceted characterization program designed for the 200-PO-1 OU RI/FS. Developed to complement DOE/RL-2003-04 and provide additional information to support completion of the RI/FS. Includes monitoring wells that are also identified in DOE/RL-2003-04.	Characterization and monitoring results are reported in DOE/RL-2009-85, <i>Remedial Investigation Report for the 200-PO-1 Groundwater Operable Unit</i> .	Monitoring and characterization activities required for the 200-PO-1 OU RI are complete. However, TPA-CN-2-253 states that Appendix A of DOE/RL-2007-31 remains in effect until an approved RAWP is in place. The monitoring to be conducted until issuance of the ROD and RAWP are addressed in this new SAP. Monitoring focuses on delineation of the plumes associated with the COPCs identified within the RI report. This new SAP will supersede TPA-CN-2-253.
DOE/RL-2012-59 (published October 2013)	<i>Sampling and Analysis Plan for Groundwater Surveillance Monitoring on the Hanford Site</i>	Part of the document identifies locations, sampling frequency, and analytical requirements for confined aquifer wells located across multiple groundwater OUs. Provides monitoring requirements for the upper basalt-confined aquifer and the Ringold-confined aquifer. Includes monitoring wells that are also identified in DOE/RL-2003-04 and DOE/RL-2007-31, Appendix A.	Monitoring results support Hanford Site environmental surveillance. The plan also supports DOE/RL-91-50, <i>Hanford Site Environmental Monitoring Plan</i> , which is required by DOE orders and DOE/RL-89-12, <i>Hanford Site Ground Water Protection Management Plan</i> .	Sampling and analysis of wells monitoring the upper basalt-confined aquifer within the 200-PO-1 OU are addressed in DOE/RL-2012-59. To eliminate duplication, monitoring of the basalt-confined aquifer wells will not be included in the new SAP.

Table 1-1. Summary of Sampling Plans with Overlapping Requirements

Document Number	Document Title	Scope	Data Use	New 200-PO-1 SAP
DOE/RL-2002-11 (published December 2008)	<i>300-FF-5 Operable Unit Sampling and Analysis Plan</i>	SAP addressing continued groundwater monitoring requirements for the 300-FF-5 OU. Specifies groundwater monitoring requirements associated with the 1996 ROD (EPA/ROD/R10-96/143, <i>Record of Decision for the 300-FF-1 and 300-FF-5 Operable Units, Hanford Site, Benton County, Washington</i>). Includes monitoring wells that are also identified in DOE/RL-2003-04 and DOE/RL-2007-31, Appendix A.	Monitoring results support analysis of implementation of the 1996 ROD (EPA/ROD/R10-96/143) and subsequent remedial actions.	Sampling and analysis of wells surrounding the 618-10 and 618-11 Burial Grounds are addressed by DOE/RL-2002-11. To eliminate duplication, monitoring of these wells will not be included in this new SAP. A revision to the 300-FF-5 OU monitoring plan that includes wells associated with 618-11 monitoring is identified in TPA-CN-611, <i>Tri-Party Agreement Change Notice Form: DOE/RL-2002-11, Rev. 2, 300-FF-5 Operable Unit Sampling and Analysis Plan</i> (issued 02/11/14).

OU = operable unit

RAWP = remedial action work plan

RI/FS = remedial investigation/feasibility study

ROD = record of decision

SAP = sampling and analysis plan

1.2 Background

Hydrogeology, groundwater flow, contaminant plumes, and source of contamination are summarized in this section. An overview of the DQO process directing the sampling objectives and identification of the COPCs is also provided.

1.2.1 Hydrogeology

The unconfined aquifer within the 200-PO-1 Groundwater OU occurs within the Hanford formation or underlying Ringold Formation. Confined and semiconfined aquifer conditions occur locally below the Ringold lower mud unit (LMU) (DOE/RL-2003-04). Evidence suggests that there is no significant communication between the unconfined or locally confined aquifers above the Columbia River Basalts and the confined aquifers within the basalts within the 200-PO-1 OU. A large flood channel filled with Hanford formation sediment (deposited during cataclysmic Pleistocene floods) extends across the 200 East Area from northwest to the southeast. This flood channel cuts completely through the Ringold Formation in the northern part of the 200 East Area such that Hanford formation sediment rest directly upon basalt. In the southeast portion the 200 East Area (within the 200-PO-1 Groundwater OU), the flood channel extends through the Ringold Formation LMU, a major locally confining layer, such that the sand and gravel of the Hanford formation lie directly upon the sand and gravel of the lower portions of the Ringold Formation. Therefore, within and near the large flood channel, hydraulic communication exists between the uppermost, unconfined aquifer and any partially or locally confined aquifers in the lower portions of the Ringold Formation.

1.2.2 Groundwater Flow

Depth-to-water measurements are collected from all wells at the time of sampling. A representative set of wells is measured in the spring of each year to make a comprehensive water table map (SGW-38815). Because of the very low hydraulic gradient (i.e., the water table is very flat) within the 200 East Area, supplemental measurements are performed, utilizing a more accurate methodology on selected wells to assist in determining local flow directions (SGW-54165). Figures 1-2 and 1-3 show the water table map and interpreted flow directions in the 200 East Area and southeastern portion of the 200-PO-1 OU for 2012. The depth to the uppermost unconfined aquifer in the Near Field (source) area of the 200-PO-1 Groundwater OU is more than 91.4 m (300 ft) near the southern boundary of the 200 East Area, and it varies in depth to near 0 m (0 ft) below ground surface at the Columbia River. Springs and seeps occur along the riverbanks where the aquifer flows laterally out of the ground directly into the river in places and/or down the sloping river shoreline into the river. The Ringold Formation LMU represents the base of the unconfined suprabasalt aquifer throughout the majority of the 200-PO-1 Groundwater OU, except where it is absent in the northern and central portions of the 200 East Area. The thickness of the suprabasalt aquifer ranges from near 0 m (0 ft) in the northern portions of the 200-PO-1 Groundwater OU (200 East Area Near Field), where basalt bedrock and/or Ringold LMU extends above the water table, to more than 215 m (700 ft) in the central portion of the basin downthrown from the May Junction fault. Water levels in wells that penetrated the LMU are generally positioned at the top of the unit. Because of depth to the aquifer and minimal natural recharge, seasonal changes to the aquifer do not occur.

Groundwater within the 200-PO-1 Groundwater OU generally flows within the upper unconfined aquifer within the Hanford or underlying Ringold Formations, within portions of the lower Ringold Formation that locally are confined beneath Ringold Formation muds, and confined aquifers within the Columbia River Basalts below the Ringold Formation (DOE/RL-2002-39, *Standardized Stratigraphic Nomenclature for Post-Ringold Formation Sediments Within the Central Pasco Basin*; PNNL-12261, *Revised Hydrogeology for the Suprabasalt Aquifer System, 200-East Area and Vicinity, Hanford Site, Washington*; and PNNL-13080, *Hanford Site Groundwater Monitoring: Setting, Sources and Methods*).

1 In some regions of the 200-PO-1 Groundwater OU, the very uppermost portion of the unconfined aquifer
2 is within the lower portion of the Hanford formation and/or Cold Creek Unit, which unconformably
3 overlies the Ringold Formation. These younger, more permeable sediments can create preferential
4 groundwater flow within the very uppermost portion of the unconfined aquifer because of their relatively
5 higher hydraulic conductivity (K_h) compared to the underlying Ringold Formation (Figures 1-4 and 1-5).

6 Estimates of flow directions based solely on water table contours are variable within the 200 East Area
7 because of the very low water table gradient. The predominant groundwater flow direction is best
8 interpreted by tracking the major groundwater plumes of iodine-129, nitrate, and tritium, as shown in
9 Figure 1-6. Groundwater in the unconfined aquifer flows primarily to the southeast in the west portion of
10 the OU (200 East Area) in response to higher heads in the west and the large paleochannel complex
11 incised in the top of the Ringold Formation, which trends the same direction. In the central to eastern
12 portion of the OU, groundwater flow fans outward to the northeast, east, and southeast as it approaches
13 the Columbia River (Figure 1-3). Flow directions of the iodine-129 and tritium plumes reflect these
14 general trends (Figures 1-6 and 1-7).

15 Vertical head differences in the OU generally increase with depth, forming an upward gradient. In the
16 200 East Area, the hydraulic head difference between the aquifers below the Ringold Formation LMU
17 and the unconfined aquifer ranges from a few centimeters (approximately 1 in.) to about 1 m (3.3 ft).
18 Along the Columbia River, in the east side of the OU, the vertical head difference is about 10 m (32.8 ft),
19 while the 600 Area between the two areas has intermediate head differences. The exception to the general
20 upward gradient is near B Pond and the Treated Effluent Disposal Facility (TEDF) where the heads
21 decrease with depth, which is possibly a condition remaining from the time that the B Pond System was
22 in operation or due to the current discharges at TEDF.

23 **1.2.3 Sources of Groundwater Contamination**

24 Operations in the 200 Areas were related to the chemical separation of plutonium from irradiated nuclear
25 fuel. Past operations in the PUREX Plant, B Plant, and U Plant resulted in liquid disposal to the soil
26 column in the OU area, which in turn contaminated the underlying groundwater. Waste streams included
27 steam condensate, process cooling water, chemical sewer waste, and acid fractionator condensate
28 (DOE/RL-95-100, *RCRA Facility Investigation Report for the 200-PO-1 Operable Unit*).

29 The PUREX process used tributyl phosphate in a normal paraffin hydrocarbon solvent to recover uranium
30 and plutonium from irradiated fuel rods dissolved in nitric acid solutions. The plant operated from 1955 to
31 1972 and again from 1983 to 1992, when it was officially terminated. Low-level PUREX waste was
32 disposed to liquid waste disposal units such as cribs (e.g., 216-A-36B, 216-A-10, 216-A-37-1, and
33 216-A-45), trenches, and French drains (Figure 1-8). Figure 1-8 shows the location of facilities in the
34 200 East Area. High-level PUREX waste was diverted to the tank farms.

1-10

1

2

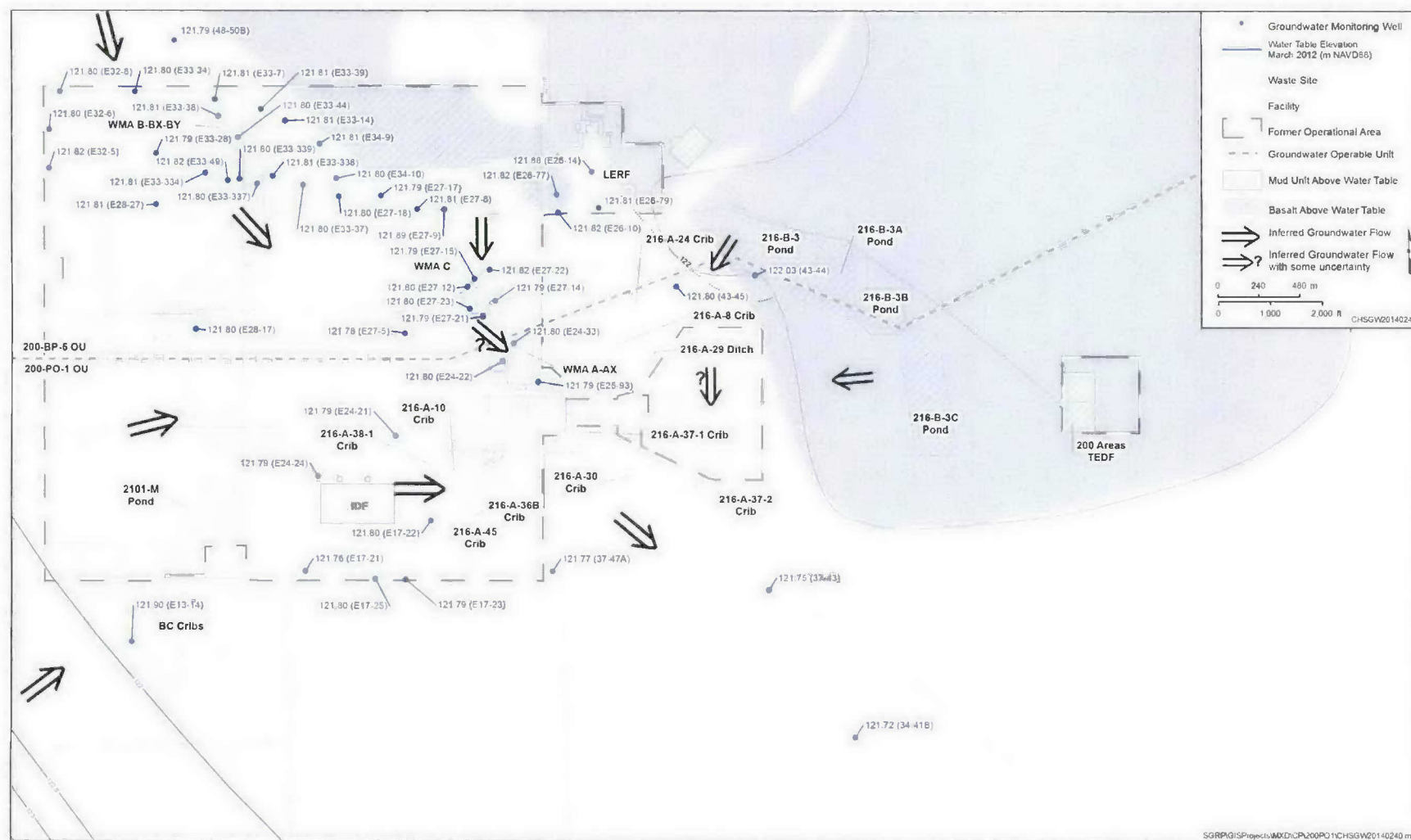
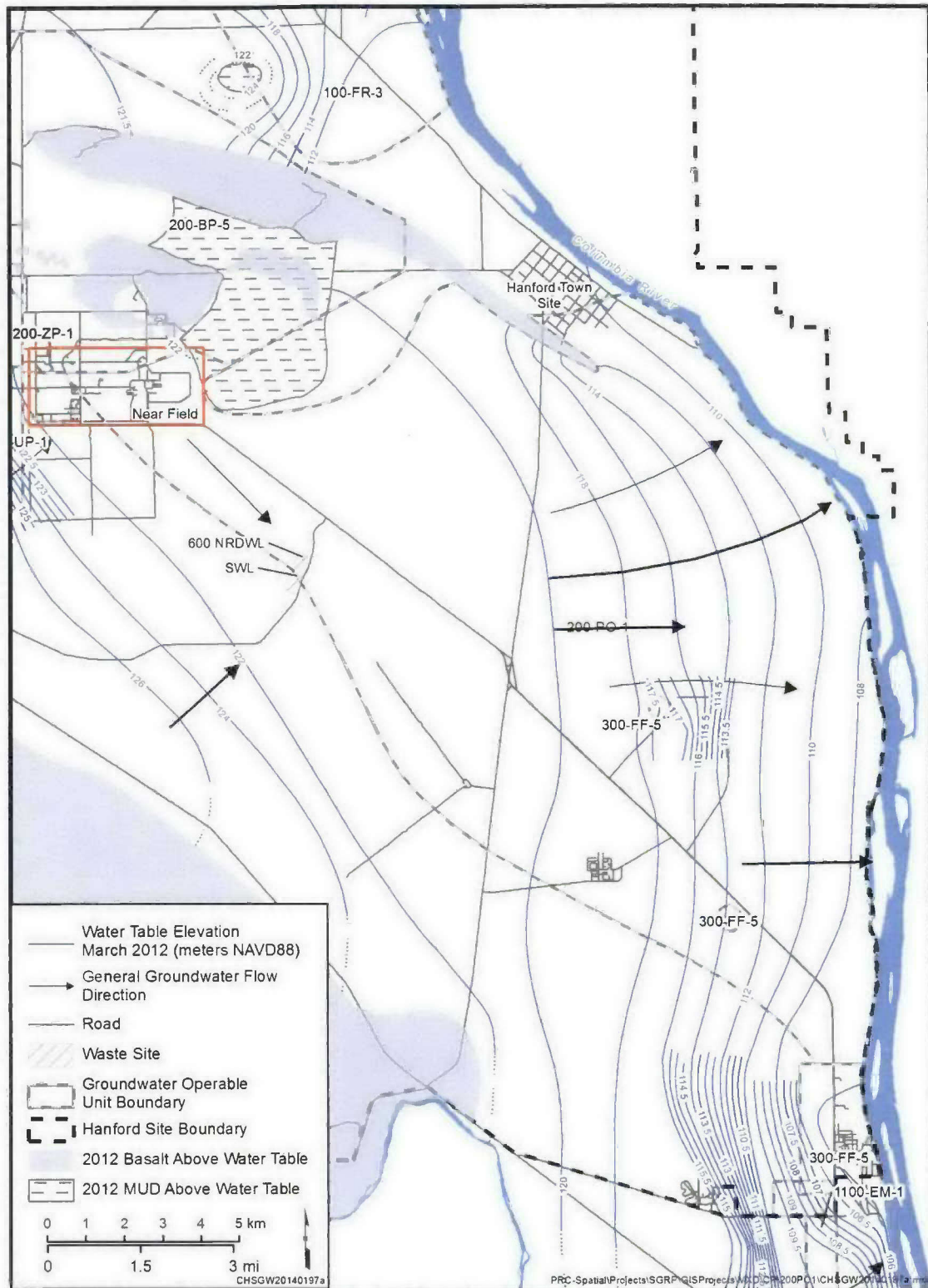


Figure 1-2. Water Table Elevations and Groundwater Flow Directions in the 200 East Near Field Area of the 200-PO-1 Operable Unit



Source: NAVD88, North American Vertical Datum of 1988.

Figure 1-3. Groundwater Flow Directions in the Southeastern and Eastern Far Field Area of the 200-PO-1 Operable Unit

1 B Plant used a bismuth phosphate process to extract plutonium from irradiated fuel rods from 1945 to
2 1952. From 1968 to 1985, the plant was used to recover cesium and strontium from tank farm waste.
3 Process cooling water and steam condensate from B Plant was sent to the B Pond. The large volumes of
4 wastewater discharged to B Pond are known to have affected both the northward and southward
5 groundwater flow in the 200 East Area.

6 Wastewater from U Plant (in the 200 West Area) was transported from the plant to the 200 East Area by
7 underground pipelines. The plant process used tributyl phosphate in kerosene to extract uranium from
8 bismuth phosphate process waste stored in the tank farms. The aqueous portion of the waste stream was
9 neutralized with sodium hydroxide and transferred to one or more tank farms. Overflow from these tanks
10 was disposed to the 200 East Area soil column to various cribs including the BC Cribs and Trenches.

11 The cribs, ponds, and ditches surrounding the PUREX Plant are responsible for most of the groundwater
12 contamination in the 200-PO-1 Groundwater OU. The PUREX Plant started operations in 1956,
13 eventually replacing the Reduction-Oxidation (REDOX) Plant as the plutonium separations facility.
14 The first PUREX operational campaign was from 1956 to 1972. Following an 11-year shutdown,
15 operations restarted in 1983 and shut down in December 1988 when the weapons production mission
16 ended. Plant operation briefly restarted in December 1989 to stabilize material in the system. Groundwater
17 contamination plumes from the PUREX Plant processes primarily contain those species associated with
18 process condensates, including contaminants in the three major plumes (tritium, nitrate, and iodine-129).
19 Some strontium-90 and technetium-99 are associated with PUREX waste disposal, although
20 technetium-99 is not found above the 900 pCi/L DWS in contaminant plumes from PUREX cribs.
21 Technetium-99 exceeds the DWS beneath WMA A-AX.

22 A composite analysis for low-level waste disposal in the 200 Areas (PNNL-11800, *Composite Analysis*
23 *for Low-Level Waste Disposal in the 200 Area Plateau of the Hanford Site*) and the initial assessment
24 completed with the system assessment capability (PNNL-14027, *An Initial Assessment of Hanford Impact*
25 *Performed with the System Assessment Capability*) both make the point that the majority of tank waste
26 inventory sent to the liquid discharge sites was disposed at the BC Cribs and Trenches.

27 The inventory of contaminants or constituents discharged to the waste sites is summarized in the
28 200-PO-1 RI Report (DOE/RL-2009-85). The inventory was determined using the Soil Inventory Model
29 (SIM), as documented in RPP-26744, *Hanford Soil Inventory Model, Rev. 1*, which generates inventory
30 and uncertainty estimates for 46 radionuclides and 29 chemicals using approximately 200 waste streams
31 applied to about 400 liquid waste disposal sites, unplanned releases, and tank leaks primarily located on
32 the Central Plateau portion of the Hanford Site. The calculation period is from 1944 to 2001, and the
33 inventory is estimated in 1-year increments that is then decay-corrected to a common date of January 1,
34 2001. The output of SIM is in terms of discharged mass (kg) for the chemicals and activity (Ci) for the
35 radionuclides.

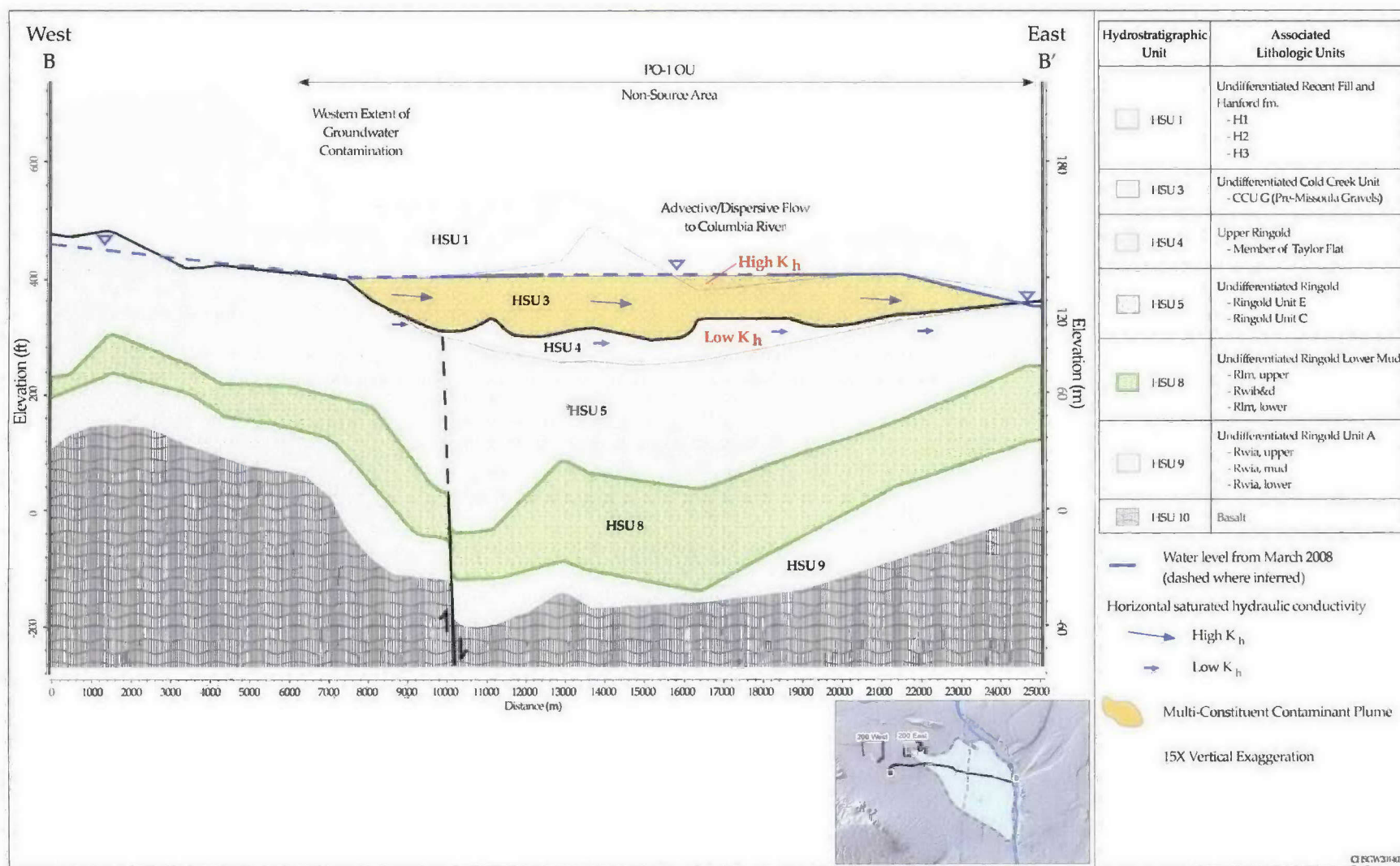


Figure 1-4. East-West Generalized Cross-Section Showing Relationship of Hydrostratigraphic Units to Preferential Groundwater Flow Within the Far Field

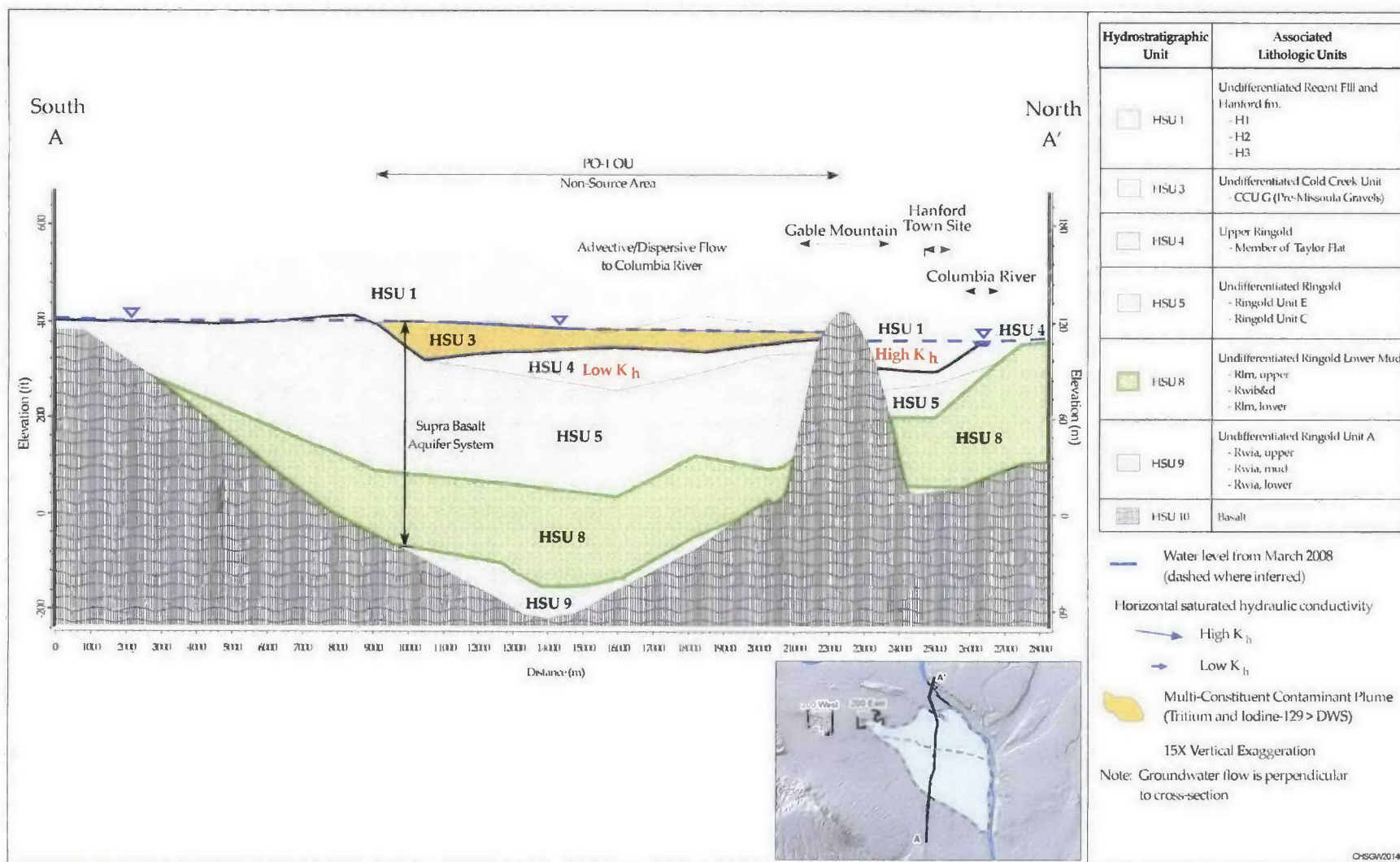


Figure 1-5. North-South Generalized Cross-Section Showing Relationship of Hydrostratigraphic Units to Preferential Groundwater Flow Within the Far Field

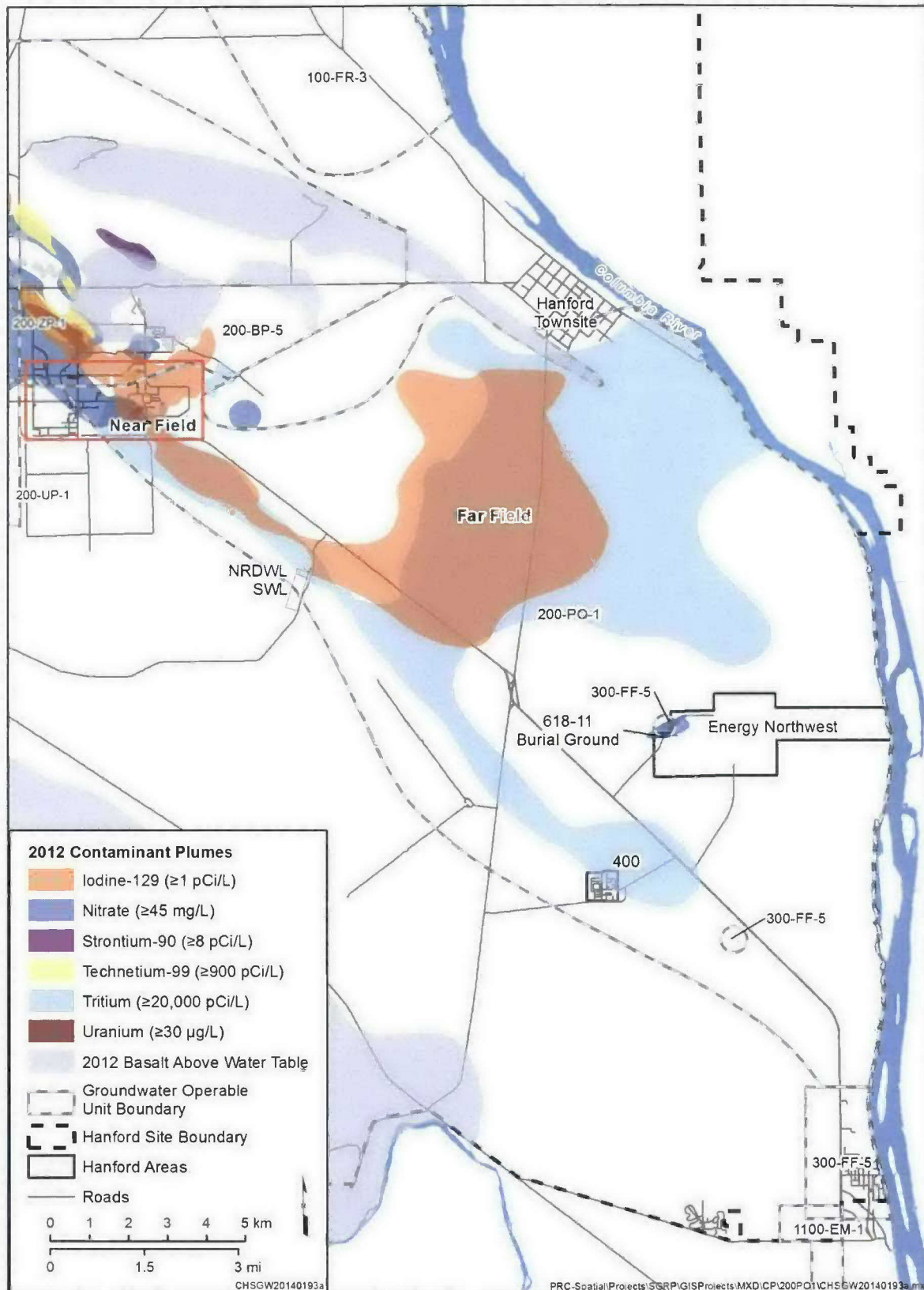


Figure 1-6. 2012 Contaminant Plumes within the 200-PO-1 Operable Unit

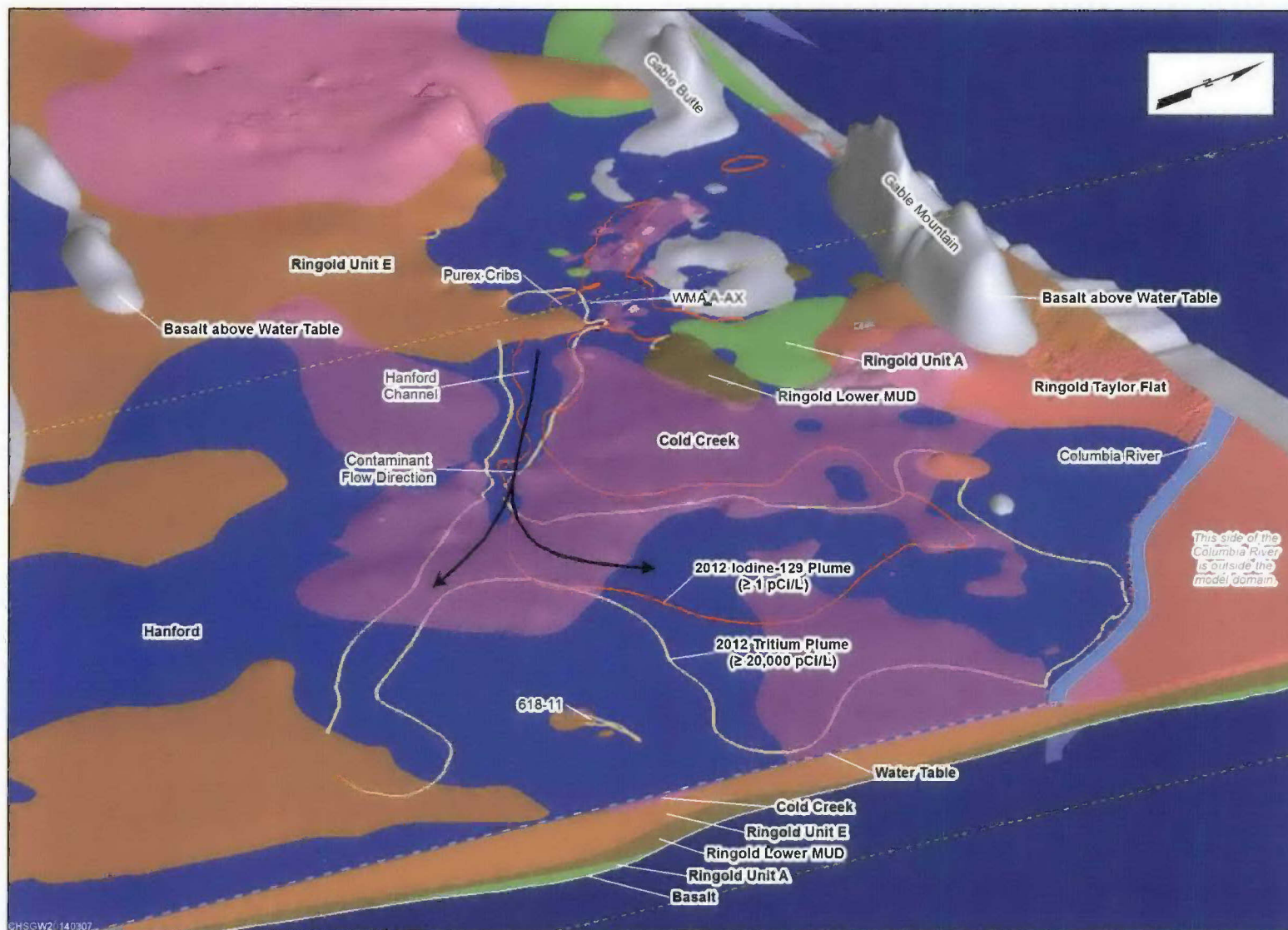


Figure 1-7. Three Dimensional Hydrogeologic Model With Perspective at the Water Table Showing Influence of Geology on Contaminant Plume Distribution



Based on the information presented in RPP-26744, there was a significant inventory of chemicals and radionuclides discharged to the vadose zone. Contaminants that were mobile and discharged in large quantities formed the major groundwater plumes in the OU (i.e., nitrate, tritium, and iodine-129). A portion of this inventory remains in the vadose zone and is considered a potential source for future groundwater contamination. However, with the cessation of artificial liquid discharges to the groundwater, the driving force has attenuated, which diminishes the overall rate of vadose zone contaminant migration. The radionuclides with long half-lives and relatively high mobility are likely to be contaminants that could affect groundwater in the future. These radionuclides include iodine-129 and technetium-99. However, due to the large discharged inventory generated at the PUREX Plant, the mobile inventory has already reached groundwater in appreciable quantity and has formed extensive iodine-129 and tritium plumes. The concentrations of tritium in groundwater in the Central Plateau portion of Hanford Site have been declining, indicating that either most of the tritium mass has traveled through the aquifers in the Central Plateau or has undergone decay due to a relatively short half-life (approximately 12.5 years). The primary sources of iodine-129 contaminants were from PUREX discharges of process effluent waste streams to the soil column. Iodine-129 is a mobile, long-lived radionuclide with a half-life of 15.7 million years. Following the end of PUREX operations, there has been a gradual decreasing trend in iodine-129 concentrations in groundwater and a slightly reduced areal extent of the iodine-129 plume.

Further discussions regarding the relationship of groundwater plumes and their association with overlying sources are provided in DOE/RL-2009-85. Uncertainty exists with regard to future vadose zone contributions to groundwater from the overlying source waste sites. Potential future groundwater impacts from waste site or vadose zone contamination will be assessed as part of the CERCLA RI/FS process for the associated source OUs as defined and scheduled in the TPA (Ecology et al., 1989a). Additional discussion concerning process inventory and potential contaminant contribution to the vadose zone from waste sites in the 200-PO-1 OU portion of the 200 East Area is provided in DOE/RL-2009-85.

1.2.4 COPC Plumes

Groundwater contamination within the 200-PO-1 OU occurs in plumes covering relatively large areas (major plume) and relatively small areas (minor plume). The major COPC plumes consist of iodine-129, nitrate, and tritium. The minor plumes consist of strontium-90, technetium-99, and uranium. The iodine-129 and tritium plumes extend beyond the 200 East Area boundary (Figure 1-6). The primary sources of these plumes are the PUREX Cribs in the southeast portion of the 200 East Area (Figure 1-8). The locations of the wells within the 200-PO-1 OU monitoring network are provided in Figures 3-1 and 3-2 (Chapter 3). Much of the information in the following section was taken from the 2012 Hanford Site annual groundwater report (DOE/RL-2013-22, *Hanford Site Groundwater Monitoring Report for 2012*).

1.2.4.1 Major Plumes

Tritium – Concentrations of tritium exceed the DWS (20,000 pCi/L) over a large portion of the 200-PO-1 Groundwater OU. As shown in Figure 1-6, the tritium plume extends beyond the 200 East Area and has reached the Columbia River. Separate tritium pulses associated with the two periods of PUREX Plant operations contributed to the plume. The first pulse, which resulted from discharges during 1955 to 1972, can be detected near the Columbia River. Elevated tritium concentrations, measured immediately downgradient from the 200 East Area, represent the second pulse associated with the re-start of operations between 1983 and 1988. Tritium is a relatively short-lived radionuclide with a 12.3-year half-life. Another small plume of tritium source at the 618-11 Burial Ground is located within the 300-FF-5 Groundwater OU (Figure 1-6).

1 The highest current and historical concentrations of tritium have been detected near the PUREX cribs and
2 trenches, which were the major sources of this contaminant (Figures 1-8 and 1-9). The tritium plume
3 continues to migrate across the Far Field area and discharge into the Columbia River to the east
4 (Figure 1-6). The plume continues to attenuate in the Far Field region due to dispersion and radioactive
5 decay of tritium, but concentrations near the PUREX cribs and trenches remain up to 30 times the DWS
6 of 20,000 pCi/L. The tritium plume has decreased in size by approximately 44 percent since 1996.
7 In 2012, the highest concentrations of tritium in the Near Field area were 610,000 pCi/L in well
8 299-E17-1 near the 216-A-10 Crib and 560,000 pCi/L in well 299-E17-19 near the 216-A-37-1 Crib
9 (Figure 1-8 and Table A3-3 in Appendix A). The highest concentration of tritium detected during 2012
10 from the Far Field was 1,100,000 pCi/L for a sample collected in October at well 699-13-3A.
11 Well 699-13-3A is associated with the 618-11 Burial Ground (Figure 1-6). This well is part of the
12 300-FF-5 monitoring network and will no longer be included under the 200-PO-1 OU groundwater
13 monitoring scope per revisions made in this new SAP.

14 An area of lower tritium concentrations identified in the Far Field region near the Energy Northwest
15 complex (Figure 1-6) is due to a zone of lower hydraulic conductivity material in the unconfined aquifer,
16 where the water table is within the upper portion of the Ringold Formation, which has a greater degree of
17 local cementation. The zone of lower hydraulic conductivity has resulted in groundwater flow and tritium
18 contamination moving around this area (Figure 1-7).

19 Wells screened (or casings perforated) in the middle to lower portions of the unconfined aquifer
20 (Appendix B, Table B1-2) had tritium results ranging from non-detect to 10,000 pCi/L
21 (well 299-E25-29Q in the Near Field region) in 2012. Sampling at well 699-37-E4 (in the Far Field
22 region) in 2010 reported a concentration of 62,000 pCi/L (Appendix A, Table A3-3). Similar
23 concentrations in the upper unconfined aquifer are detected near well 699-37-E4. Tritium has been
24 detected above the DWS in well 699-37-E4 since the time sampling for tritium began in the well in 1990.
25 In the main water supply well in the 400 Area (well 499-S1-8J), tritium was detected in 2012 at a
26 concentration of 3,600 pCi/L (Appendix A, Table A3-3).

27 Tritium concentrations in wells sampled in 2012 screened in the Ringold confined aquifer in Far Field
28 well 699-42-42B, located near the 216-B-3 Pond, ranged from non-detect to 15,200 pCi/L. Well
29 699-41-40 (in the Far Field region) sampled in 2010 had a tritium concentration of 36,000 pCi/L. Tritium
30 has been detected above the DWS in well 699-41-40 since sampling began at this well in 1990. From
31 1990 to 2010, the tritium concentration has decreased from 226,000 pCi/L to 36,000 pCi/L in well
32 699-41-40. No unconfined aquifer is located at this well location.

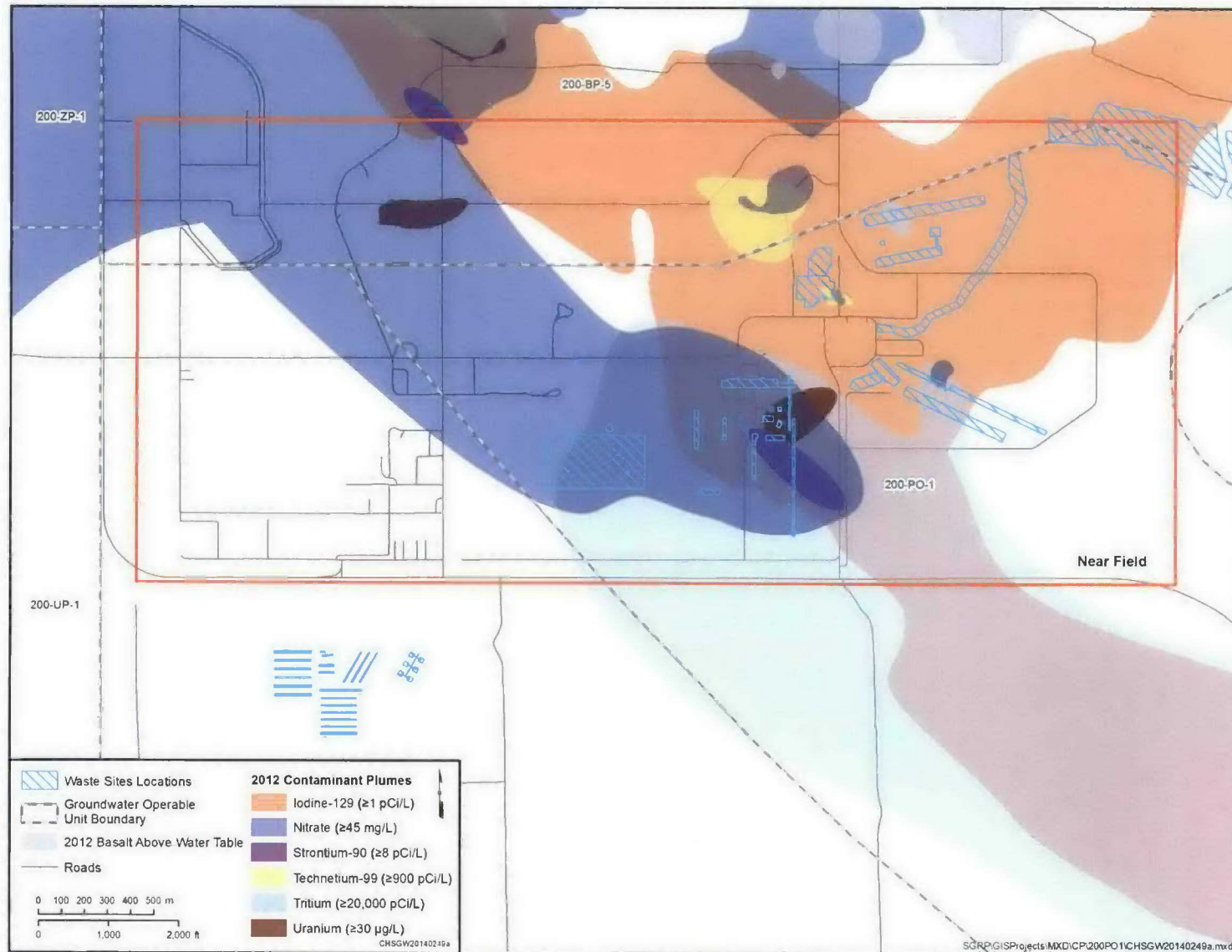


Figure 1-9. 2012 Contaminant Plumes within the Near Field of the 200-PO-1 Operable Unit

Iodine-129 – Iodine-129 is a moderately mobile, long-lived radionuclide with a 1.7×10^7 -year half-life. Iodine-129 at a concentration greater than the 1 pCi/L DWS is found in a relatively dispersed plume that covers a large area within the 200-PO-1 OU (Figure 1-6). The iodine-129 plume extends southeast and east from the southeast portion of the 200 East Area (Figures 1-6 and 1-9). The highest current and historical concentrations have been detected near the PUREX cribs and trenches (Figures 1-8 and 1-9). Concentrations detected in Near Field wells in 2012 ranged from non-detect to 11.4 pCi/L (Appendix A, Table A3-2). Iodine-129 at concentrations greater than 5 times the DWS were detected near the PUREX cribs and trenches, 216-A-29 Ditch, and WMA A-AX. None of the detected concentrations exceeded the DOE-derived concentration standard of 330 pCi/L (Table 5 of DOE-STD-1196-2011, *Derived Concentration Technical Standard*). In 2012, the highest concentrations of iodine-129 were detected in wells 299-E24-16 (11.4 pCi/L) and 299-E17-19 (10.2 pCi/L), located downgradient of the 216-A-10 crib (Appendix A, Table A3-2 and Figure 1-8). Within the middle and lower unconfined aquifer, iodine-129 was detected in two wells in the Near Field region at concentrations above the DWS (4.2 pCi/L in well 299-E25-28 located near the 216-A-29 ditch, and 2.4 pCi/L in well 299-E25-29Q near the 216-A-30 crib, and the 216-A-37-1 and 216-A-37-2 cribs (Appendix A, Table A3-2 and Appendix B, Table B1-2). Iodine-129 was not detected in monitoring wells screened in the middle and lower unconfined aquifer in the Far Field region. The Ringold confined aquifer is monitored near the 216-B-3 Pond and TEDF facility in the 200-PO interest area. In 2012, iodine-129 was detected above the DWS near the 216-B-3 Pond in Ringold-confined wells 699-42-42B and 699-43-44 (Appendix A, Table A3-2).

Nitrate –The nitrate concentrations above 45 mg/L tend to occur as small, isolated portions of the overall plume and may represent slugs of contamination related to separate historical disposal events (Appendix A, Table A3-1). Nitrate is a mobile contaminant and has reached the Columbia River in earlier years at concentrations above the maximum contaminant level (MCL). The nitrate plume has diminished to the point that no portions of the plume are over the MCL flowing into the Columbia River.

The highest historical concentrations of nitrate in 200-PO-1 OU have been detected near the PUREX cribs and trenches (Figures 1-8 and 1-9; Appendix A, Table A3-1). The extent of nitrate at concentrations greater than the 45 mg/L DWS is relatively small within the 200-PO-1 OU (Figure 1-9). Historically, the nitrate plume was much larger; but concentrations within the Far Field region have decreased below the 45 mg/L DWS. During 2012, the highest nitrate concentrations in 200-PO-1OU were at wells near the PUREX Cribs (Figures 1-8 and 1-9). The highest concentrations from samples collected during 2012 were 151 mg/L at well 299-E17-19, located downgradient of the 216-A-10 crib, and 116 mg/L from well 299-E17-14, located downgradient of the 216-A-36B crib (Appendix A, Table A3-1). Many of the wells near the PUREX Cribs in the southeastern portion of the 200 East Area have exhibited increasing nitrate concentrations since approximately 2007 (Appendix A, Table A3-1). The cause of the increase in nitrate concentrations in this area has not been identified but may be the result of changing groundwater flow conditions related to the cessation of wastewater discharges at B Pond, and water table elevation decreases in the 200 East Area.

For the wells screened (or casings perforated) in the middle to lower portions of the unconfined aquifer in the Near Field region (Appendix B, Table B1-2), nitrate did not exceed the 45 mg/L DWS in 2012, and based on the measurements conducted, nitrate at concentrations above the DWS appears to be found within the upper 10 m (32 ft) of the aquifer thickness. The maximum 2012 nitrate concentration was 26.7 mg/L in well 299-E25-29Q (Appendix A, Table A3-1). The highest nitrate concentration detected in the deeper unconfined wells in the Far Field region was 28.9 mg/L at well 699-2-7. This well is located near the 400 Area Process Ponds, which are a suspected source of nitrate. Nitrate was not detected in 2012 in the main water supply well for the 400 Area (well 499-S1-8J), which is located within the Far Field region (Appendix A, Table A3-1). Nitrate was detected in one well within the Ringold Formation

confined aquifer above the 45 mg/L DWS in 2012, at a concentration of 94 mg/L in well 699-39-39 (Appendix A, Table A3-1).

1.2.4.2 Minor Plumes

Strontium-90 – Strontium-90 has historically been detected in relatively small areas at concentrations greater than the DWS of 8 pCi/L near the 216-A-5, 216-A-10, and 216-A-36B cribs (Appendix A, Table A3-5 and Figure 1-8). Recent concentrations exceeding the MCL of 8 pCi/L only occurred at well 299-E17-14 (Appendix A, Table A3-5). A relatively small plume remains near the 216-A-36B crib (Figures 1-8 and 1-9). Since sampling was started for strontium-90 from well 299-E17-14 in 1988, concentrations have fluctuated, ranging from 11 pCi/L to 30 pCi/L. The 2012 result for 299-E17-14 was 15 pCi/L, which was lower than the 2011 result of 30 pCi/L (Appendix A, Table A3-5).

Other wells near the PUREX cribs and trenches within the 200-PO-1 Near Field region in which strontium-90 was detected, but at concentrations below the DWS were 7.80 pCi/L in well 299-E24-16 and between 0.6 to 1.6 pCi/L in six Near Field wells (299-E17-18, 299-E17-1, 299-E17-16, 299-E17-19, 299-E24-23, and 699-37-47A). In 2012, strontium-90 was detected in Far Field 299-E13-5, located near the BC cribs and trenches, at a concentration of 0.64 pCi/L (Appendix A, Table A3-5).

Strontium-90 is not analyzed for in the middle or deep unconfined aquifer wells, except water supply well 499-S1-8J. Strontium-90 was not detected in 2012 samples collected from this well (Appendix A, Table A3-5). Strontium-90 is not analyzed for in the Ringold confined aquifer wells.

Technetium-99 – Technetium-99 has historically been detected in one relatively small area in the 200-PO-1 OU Near Field region around WMA A-AX (Figures 1-8 and 1-9). Groundwater impacts detected in the vicinity of WMA C, located northwest and upgradient of WMA A-AX, are expected to continue to impact groundwater in this area of 200-PO-1 OU (Figures 1-9). Concentrations greater than the 900 pCi/L DWS have been detected in groundwater in this area since 2003.

In 2012, technetium-99 was detected above a concentration of 900 pCi/L at wells 299-E25-93 and 299-E25-23 near WMA A-AX (Appendix A, Table A3-6). Concentrations above the 900 pCi/L DWS have been detected in well 299-E25-93 during the time since the well was drilled in 2003. In 2012, detections ranged from 1,400 to 2,500 pCi/L. In the Far Field region to the east and southeast of the 200 East Area, technetium-99 has been detected at low concentrations. In the Ringold confined aquifer in the vicinity of 216-B-3 Pond, technetium-99 was monitored in wells 699-42-42B and 699-42-40A in 2012 but was not detected.

Uranium – Uranium has been identified historically as a relatively small plume in the Near Field area (Figure 1-9). In 2012, concentrations of uranium above the 30 µg/L DWS were detected in three wells. Concentrations of 59.9 µg/L, 36.9 µg/L, and 31.7 pCi/L were measured at wells 299-E25-36, 299-E24-23, and 299-E17-14, respectively (Appendix A, Table A3-4). Uranium concentrations at well 299-E25-36 have been decreasing since 2007 (Appendix A, Table A3-4). Uranium remains somewhat mobile in groundwater at 200-PO-1 OU and the concentration changes observed are consistent with continued slow migration of uranium away from source areas. Uranium concentrations at well 299-E17-14 have been generally increasing since the early 1990s, with concentrations near the 30 µg/L DWS since 2006. In 2012, the concentration was above the DWS. Uranium concentrations have been variable, ranging from 106 to 36.9 µg/L, at well 299-E24-23 since the time sampling began in 2007.

1.3 Data Quality Objective Process Summary

In 2003, Pacific Northwest National Laboratory (PNNL) developed DQOs for the 200-PO-1 and 200-BP-5 Groundwater OUs, following guidance from EPA/240/B-06/001, *Guidance on Systematic*

1 *Planning Using the Data Quality Objectives Process* (EPA QA/G-4). The results are described in
2 PNNL-14049, *Data Quality Objectives Summary Report – Designing a Groundwater Monitoring*
3 *Network for the 200-BP-5 and 200-PO-1 Operable Units*. As described in PNNL-14049, the DQO
4 process for the 200-PO-1 Groundwater OU established a framework to answer the following questions.

- 5 • Does the monitoring network adequately define the extent of the COPC groundwater plumes?
- 6 • Will the monitoring network adequately measure water table elevations and define groundwater flow
7 directions?
- 8 • Do the sampling frequencies permit tracking of plume movement?

9 The results of the DQO process for the 200-PO-1 Groundwater OU provided the basis for the monitoring
10 network and design, which were implemented in the original SAP for the 200-PO-1 Groundwater OU
11 (DOE/RL-2003-04).

12 DQOs were developed for the 200-PO-1 Groundwater OU RI/FS (SGW-34011, *Data Quality Objectives*
13 *Summary Report Supporting the 200-PO-1 Groundwater Operable Unit*). The objectives were the
14 framework for the RI work plan SAP (DOE/RL-2007-31, Appendix A). Because the RI/FS
15 characterization had a much broader scope than the routine 200-PO-1 Groundwater OU groundwater
16 monitoring, additional COPCs were identified. Specifically, the 200-PO-1 Work Plan SAP lists
17 44 COPCs based on two primary rationale.

- 18 • Known groundwater contaminants with concentrations greater than state and/or federal MCLs were
19 listed as contaminants of concern (COCs).
- 20 • Potential contaminants for which no analytical data were available, and which had therefore not been
21 ruled out as groundwater contaminants were considered COPCs.

22 The first category, known groundwater contaminants, reflects the same constituents listed by
23 PNNL-14049 as COCs. The second category were to be addressed in a limited-duration but
24 comprehensive program of sampling and analysis described in Appendix A of DOE/RL-2007-31. If the
25 RI characterization program revealed additional groundwater contaminants within the OU, the additional
26 contaminants were to be added for routine monitoring.

27 In association with development of this SAP, the DQO process was undertaken to support identification
28 of sampling requirements appropriate for the current SAP objectives. The DQO process followed for this
29 SAP and its resulting application to refine the well network and focus the sampling requirements, is
30 provided in Appendix A. The purpose of the DQO process was to support the optimization of the routine
31 monitoring network in the 200-PO-1 groundwater OU for the post-RI time period until a ROD has been
32 obtained.

33 **1.4 Contaminants of Potential Concern**

34 Specific COPCs for CERCLA groundwater monitoring and radionuclides monitored for AEA are
35 provided in Table 1-2. The CERCLA COPCs listed are those identified following completion of the BRA
36 conducted in association with the 200-PO-1 RI (DOE/RL-2009-85) and the supplemental BRA recently
37 completed with a more current analytical data set. Radionuclides identified for AEA monitoring are
38 identified in PNNL-15315.

Table 1-2. Contaminants of Potential Concern

Contaminant	Chemical Abstracts Service Number	CERCLA	Waste Site Specific AEA Monitoring Requirements
Nitrate	14797-55-8	X	
Iodine-129	15046-84-1	X	
Strontium-90	10098-97-2	X	
Technetium-99	127-18-4	X	X
Tritium	10028-17-8	X	
Uranium	7440-61-1	X	

AEA = *Atomic Energy Act of 1954*

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*

1.5 Project Schedule

This SAP will direct CERCLA and AEA monitoring activities needed for the 200-PO-1 OU until a ROD is approved. Upon issuance of a 200-PO-1 Groundwater OU ROD, a new SAP will be developed and issued in association with the preparation of the RAWP. The sampling schedule will be established through the *Sample Management Integrated Lifecycle Environment* (SMILE), which optimizes the overall number of well trips and limits schedule redundancy. SMILE allows for the tracking of overlapping requirements so single well trips can co-sample wells and optimize schedules.

2 Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPjP) establishes the quality requirements for environmental data collection. It includes planning, implementation, and assessment of sampling tasks, field measurements, and laboratory analysis. This QAPjP complies with requirements from the following documents:

- DOE O 414.1D, *Quality Assurance*
- 10 CFR 830, “Nuclear Safety Management,” Subpart A, “Quality Assurance Requirements”
- EPA/240/B-01/003, *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5)
- EPA/240/R-02/009, *Guidance for Quality Assurance Project Plans* (EPA QA/G-5)
- Ecology Publication No. 04-03-030, *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*

This chapter describes the applicable quality requirements and controls. Sections 6.5 and 7.8 of the TPA Action Plan (Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*) require the QA/quality control (QC) and sampling and analysis activities to specify the QA requirements for treatment, storage, and disposal (TSD) units, as well as for past practice processes. Therefore, this QAPjP follows the QA elements of EPA/240/B-01/003 and EPA/240/R-02/009. This QAPjP demonstrates conformance to Part B requirements of ANSI/ASQC E4-1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs*, and complies with Washington State Department of Ecology (Ecology) guidance on QAPjPs (Ecology Publication No. 04-03-030).

This QAPjP is divided into the following four sections, which describe the quality requirements and controls applicable to Hanford Site OU groundwater monitoring activities: Project Management, Data Generation and Acquisition, Assessment and Oversight, and Data Validation and Usability.

2.1 Project Management

This section addresses project goals, management approaches planned, and planned output documentation.

2.1.1 Project/Task Organization

The contractor, or its approved subcontractor, is responsible for planning, coordinating, sampling, and shipping samples to the laboratory. Project organization (regarding routine groundwater monitoring) is described in the following sections and illustrated in Figure 2-1.

2.1.1.1 Regulatory Lead

The lead regulatory agency (LRA) is responsible for regulatory oversight of cleanup projects and activities. The LRA has SAP approval authority for the OUs they manage. The LRA works with the DOE Richland Operations Office (DOE-RL) to resolve concerns over the work described in this SAP in accordance with the TPA (Ecology et al., 1989a).

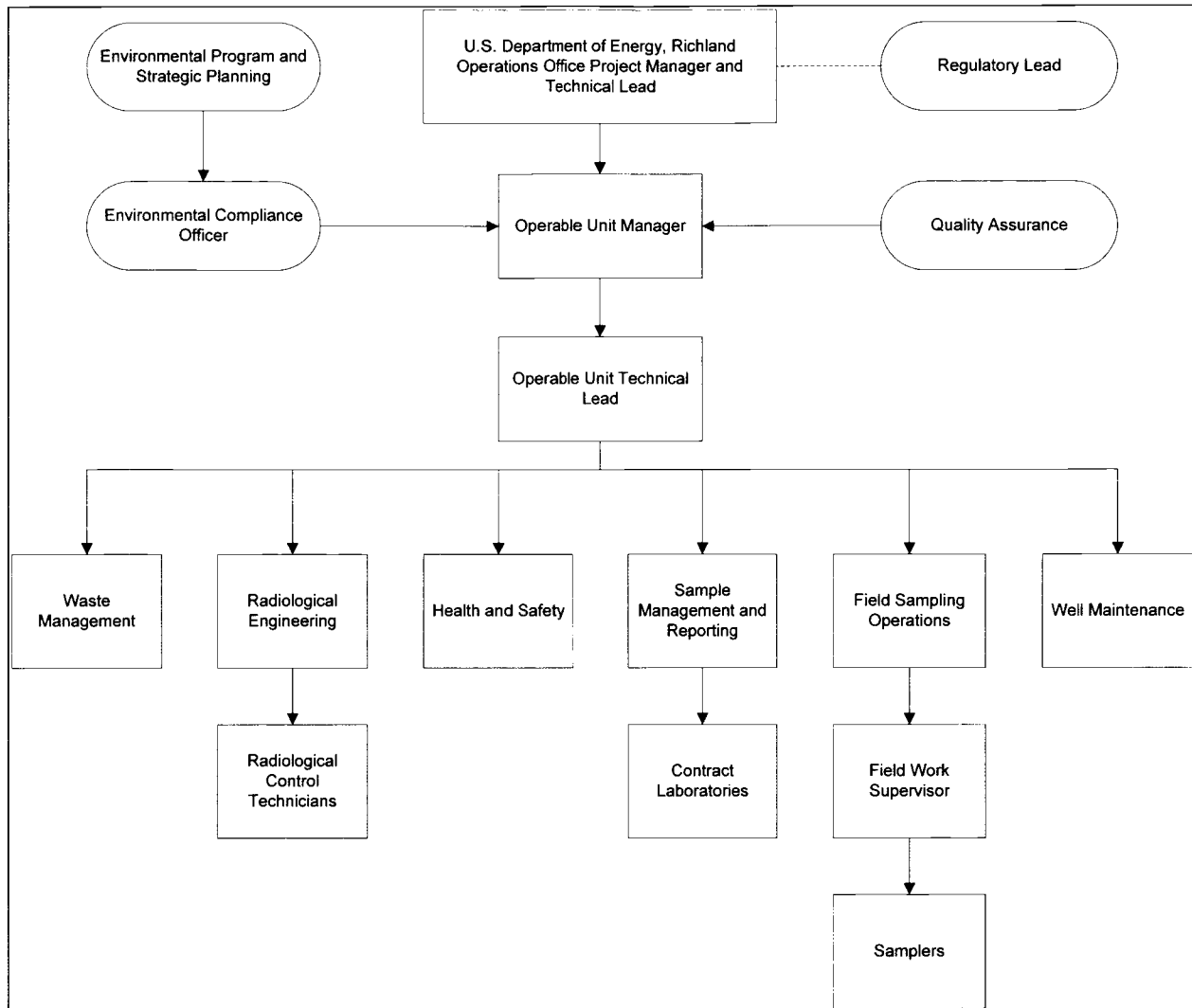


Figure 2-1. Project Organization

2.1.1.2 DOE-RL Project Manager

The DOE-RL Project Manager has the following responsibilities:

- Monitoring the contractor's performance of activities under CERCLA, RCRA, AEA, and TPA (Ecology et al., 1989a) for the Hanford Site
- Obtaining LRA approval of the SAP
- Authorizing field sampling activities

2.1.1.3 DOE-RL Technical Lead

The DOE-RL Technical Lead has the following responsibilities:

- Providing day-to-day oversight of the contractor's work scope performance, for working with the contractor and the regulatory agencies to identify and resolve technical issues
- Providing technical input to the DOE-RL Project Manager

2.1.1.4 Operable Unit Project Manager

The OU Project Manager (or designee) is responsible and accountable for the following actions:

- Project-related activities
- Coordinating with DOE-RL, regulators, and contactor management in support of sampling activities to ensure work is performed safely and cost effectively
- Managing sampling documents and requirements, field activities, subcontracted tasks, and for ensuring the project file is properly maintained

2.1.1.5 Operable Unit Technical Lead

The OU Technical Lead has the following responsibilities:

- Developing specific sampling design, analytical requirements, and QC requirements; either independently or as defined through a systematic planning process
- Ensuring that sampling and analysis activities as delegated by OU Project Manager are carried out in accordance with the SAP
- Working closely with the Environmental Compliance Officer (ECO), QA, Health and Safety, the Field Work Supervisor (FWS), and the Sample Management and Reporting (SMR) organization to integrate these and other technical disciplines in planning and implementing the work scope

2.1.1.6 Environmental Compliance Officer

The ECO has the following responsibilities:

- Providing technical oversight, direction, and acceptance of project and subcontracted environmental work
- Developing appropriate mitigation measures to minimize adverse environmental impacts
- Overseeing project implementation for compliance with applicable internal and external environmental requirements

2.1.1.7 Quality Assurance

The QA point-of-contact has the following responsibilities:

- Addressing QA issues on the project
- Overseeing implementation of the project QA requirements
- Reviewing project documents (including DQO summary report, QAPjP, and SAP)
- Reviewing data validation reports from third-party data validation contractors, as appropriate
- Participating in QA assessments on sample collection and analysis activities, as appropriate

2.1.1.8 Health and Safety

The Health and Safety organization has the following responsibilities:

- Coordinating industrial safety and health support within the project, in accordance with the health and safety program, job hazard analyses, and other pertinent federal regulation
- Assisting project personnel in complying with the applicable health and safety program

- Coordinating with Radiological Engineering to determine personal protective equipment (PPE) requirements

2.1.1.9 Radiological Engineering

Radiological Engineering is responsible for the following responsibilities:

- Radiological engineering and project health physics support
- Conducting as low as reasonably achievable (ALARA) reviews, exposure and release modeling, and radiological controls optimization
- Identifying radiological hazards and ensuring appropriate controls are implemented to maintain worker exposures to hazards at ALARA levels
- The Radiological Engineering interfacing with the project Health and Safety representative and other appropriate personnel, as needed, to plan and direct project Radiological Control Technician (RCT) support

2.1.1.10 Sample Management and Reporting Organization

The SMR organization is responsible for the following activities:

- Interfacing between the OU Technical Lead, the Field Sampling Operations (FSO), the Well Maintenance Organization, and the analytical laboratories
- Generating field sampling documents, labels, and instructions for field sampling personnel
- Monitoring the entire sample and data process
- Coordinating laboratory analytical work, and ensuring that the laboratories conform to Hanford Site QA requirements (or their equivalent), as approved by DOE, the U.S. Environmental Protection Agency (EPA), and Ecology
- Resolving sample documentation deficiencies or issues associated with the FSO, laboratories, or other entities to ensure that project needs are met
- Receiving the analytical data from the laboratories
- Ensuring data is uploaded into the Hanford Environmental Information System (HEIS)
- Arranging for, and overseeing, data validation, as requested
- Informing the OU Project Manager and/or OU Technical Lead of any issues reported by the analytical laboratory
- Developing the Sample Authorization Form (SAF), which provides information and instruction to the analytical laboratories
- Providing instructions to the FSO samplers on the collection of samples as specified in a SAP

2.1.1.11 Analytical Laboratories

Analytical laboratories are responsible for the following:

- Analyzing samples in accordance with established methods

- 1 • Providing data packages containing analytical and QC results
- 2 • Providing explanations in response to resolution of analytical issues
- 3 • Meeting DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document*
- 4 (HASQARD), QA requirements
- 5 • Being on the Mission Support Alliance Evaluated Suppliers List
- 6 • Being accredited by Ecology for the analyses performed for the Soil and Groundwater
- 7 Remediation Project

8 **2.1.1.12 Waste Management**

9 Waste Management is responsible for the following:

- 10 • Communicating policies and protocols
- 11 • Ensuring compliance for waste storage, transportation, disposal, and tracking in a safe and cost
- 12 effective manner
- 13 • Identifying waste management sampling/characterization requirements to ensure
- 14 regulatory compliance
- 15 • Interpreting data to determine waste designations and profiles
- 16 • Preparing and maintaining other documents confirming compliance with waste acceptance criteria

17 **2.1.1.13 Field Sampling Organization**

18 FSO has the following responsibilities:

- 19 • Planning, coordinating, and conducting field sampling activities
- 20 • The FWS ensuring samplers are appropriately trained and available
- 21 • Ensuring the sampling design is understood and can be performed as specified by the nuclear
- 22 chemical operators (NCOs); this is achieved by directing NCO training, performing mock-ups, and
- 23 holding practice sessions with field personnel
- 24 • The FWS directing the NCOs
- 25 • The NCOs collecting all salient samples in accordance with sampling documentation
- 26 • Completing field logbook entries, chain-of-custody forms, shipping paperwork, and ensuring delivery
- 27 of the samples to the analytical laboratory
- 28 • The FWS acting as a technical interface between the OU Project Manager and the field crew
- 29 supervisors (such as the Drilling Buyer's Technical Representative [BTR], and Geologist-BTR) and
- 30 ensuring technical aspects of the field work are met
- 31 • The FWS reviewing the SAP for field sample collection concerns, analytical requirements, and
- 32 special sampling requirements
- 33 • Resolving issues regarding implementing technical requirements to field operations and coordinating
- 34 resolution of sampling issues through consultation with the OU Project Manager and SMR

2.1.1.14 Well Maintenance

The Well Maintenance Manager has the following responsibilities:

- Well maintenance activities
- Coordinating with the OU Technical Lead to identify field constraints that could affect groundwater sampling

2.1.2 Quality Objectives and Criteria

The QA objective of this plan is to ensure the generation of analytical data of known and appropriate quality that are acceptable and useful for decision making. In support of this objective, statistics and data descriptors known as data quality indicators (DQIs) help determine the acceptability and utility of data to the user. The principal DQIs are precision, accuracy, representativeness, comparability, completeness, bias, and sensitivity. These are defined for the purposes of this document in Table 2-1.

Table 2-1. Data Quality Indicators

DQI	Definition	Determination Methodologies	Corrective Actions
Precision	Precision measures the agreement among a set of replicate measurements. Field precision is assessed through the collection and analysis of field duplicates. Analytical precision is estimated by duplicate/replicate analyses, usually on laboratory control samples, spiked samples, and/or field samples. The most commonly used estimates of precision are the relative standard deviation and, when only two samples are available, the relative percent difference.	Use the same analytical instrument to make repeated analyses on the same sample. Use the same method to make repeated measurements of the same sample within a single laboratory. Acquire replicate field samples for information on sample acquisition, handling, shipping, storage, preparation, and analytical processes and measurements.	If duplicate data do not meet objective: <ul style="list-style-type: none"> • Evaluate apparent cause (e.g., sample heterogeneity) • Request reanalysis or re-measurement • Qualify the data before use
Representativeness	Sample representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. It is dependent on the proper design of the sampling program and will be satisfied by ensuring the approved plans were	Evaluate whether measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the environment or condition being measured or studied.	If results are not representative of the system sampled: <ul style="list-style-type: none"> • Identify the reason for them not being representative • Flag for further review • Review data for usability • If data are usable, qualify the data for limited use and define the portion of the system that the data represent • If data are not usable,

Table 2-1. Data Quality Indicators

DQI	Definition	Determination Methodologies	Corrective Actions
	followed during sampling and analysis.		<p>flag as appropriate</p> <ul style="list-style-type: none"> • Redefine sampling and measurement requirements and protocols • Resample and reanalyze, as appropriate
Comparability	Comparability expresses the degree of confidence with which one data set can be compared to another. It is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the approved plans are followed and that proper sampling and analysis techniques are applied.	Use identical or similar sample collection and handling methods, sample preparation and analytical methods, holding times, and QA protocols.	<p>If data are not comparable to other data sets:</p> <ul style="list-style-type: none"> • Identify appropriate changes to data collection and/or analysis methods • Identify quantifiable bias, if applicable • Qualify the data as appropriate • Resample and/or reanalyze if needed • Revise sampling/analysis protocols to ensure future comparability
Completeness	Completeness is a measure of the amount of valid data collected compared to the amount planned. Measurements are considered to be valid if they are unqualified or qualified as estimated data during validation. Field completeness is a measure of the number of samples collected versus the number of samples planned. Laboratory completeness is a measure of the number of valid measurements compared to the total number of measurements planned.	Compare the number of valid measurements completed (samples collected or samples analyzed) with those established by the project's quality criteria (DQOs or performance/acceptance criteria).	<p>If data set does not meet completeness objective:</p> <ul style="list-style-type: none"> • Identify appropriate changes to data collection and/or analysis methods • Identify quantifiable bias, if applicable • Resample and/or reanalyze if needed <p>Revise sampling/analysis protocols to ensure future completeness.</p>

Table 2-1. Data Quality Indicators

DQI	Definition	Determination Methodologies	Corrective Actions
Bias	<p>Bias is the systematic or persistent distortion of a measurement process that causes error in one direction (e.g., the sample measurement is consistently lower than the sample's true value). Bias can be introduced during sampling, analysis, and data evaluation.</p> <p>Analytical bias refers to deviation in one direction (i.e., high, low, or unknown) of the measured value from a known spiked amount.</p>	<p>Sampling bias may be revealed by analysis of replicate samples.</p> <p>Analytical bias may be assessed by comparing a measured value in a sample of known concentration to an accepted reference value or by determining the recovery of a known amount of contaminant spiked into a sample (matrix spike).</p>	<p>For sampling bias:</p> <ul style="list-style-type: none"> • Properly select and use sampling tools • Institute correct sampling and subsampling procedures to limit preferential selection or loss of sample media • Use sample handling procedures, including proper sample preservation, that limit the loss or gain of constituents to the sample media <p>Analytical data that are known to be affected by either sampling or analytical bias are flagged to indicate possible bias.</p> <p>Laboratories that are known to generate biased data for a specific analyte are asked to correct their methods to remove the bias as best as practicable. Otherwise, samples are sent to other labs for analysis.</p>
Sensitivity	<p>Sensitivity is an instrument's or method's minimum concentration that can be reliably measured (i.e., instrument detection limit or limit of quantitation).</p>	<p>Determine the minimum concentration or attribute to be measured by an instrument (instrument detection limit) or by a laboratory (limit of quantitation).</p> <p>The lower limit of quantitation is the lowest level that can be routinely quantified and reported by a laboratory.</p>	<p>If detection limits do not meet objective:</p> <ul style="list-style-type: none"> • Request reanalysis or re-measurement using methods or analytical conditions that will meet required detection or limit of quantitation • Qualify/reject the data before use

Source: SW-846, Pending, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*, as amended.

1
2 Data quality is defined by the degree of rigor in the acceptance criteria assigned to the DQIs. Typically,
3 the acceptance criteria are set by the analytical method itself, however project-specific requirements as
4 indicated by DQOs may result in more stringent acceptance criteria. The applicable QC guidelines,

DQI acceptance criteria, and levels of effort for assessing data quality are dictated by the intended use of the data and the requirements of the analytical method. DQIs are evaluated during the data quality assessment (DQA) process (Section 2.4.3).

2.1.3 Special Training/Certification

A graded approach is used to ensure workers receive a level of training commensurate with their responsibilities and compliant with applicable DOE orders and government regulations. The FWS, in coordination with line management, will ensure special training requirements for field personnel are met.

Typical training requirements or qualifications have been instituted by the contractor management team to meet training and qualification programs to satisfy multiple training drivers imposed by the applicable *Code of Federal Regulations* (CFR) and WAC requirements. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Field personnel typically complete the following training before starting work:

- Occupational Safety and Health Administration 40-Hour Hazardous Waste Worker Training and supervised 24-hour hazardous waste site experience
- 8-Hour Hazardous Waste Worker Refresher Training (as required)
- Hanford General Employee Training (including Hanford General Employee Radiation Training)
- Radiological Worker Training

Project-specific safety training, focused specifically to project activities, is provided in OU-specific addenda. Project-specific training may include the following:

- Training qualifications needed to comply with QA requirements.
- Samplers are required to have training and certifications for the type of sampling being performed.
- RCT qualifications are established by the Radiation Protection Program. RCTs assigned to projects will be qualified through the prescribed training program and will undergo ongoing training and qualification activities.

In addition, pre-job briefings in accordance with work management and work release documents evaluation activities and associated hazards including the following:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Controls applied to mitigate the hazards
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Proximity of emergency contacts

Training records are maintained for each employee in an electronic training record database. The contractor's training organization maintains the training records system. Line management confirms that an employee's training is appropriate and up-to-date prior to performing any field work.

2.1.4 Documents and Records

The OU Project Manager (or delegate) is responsible for ensuring the current version of the SAP is being used and providing updates to field personnel. Version control is maintained by the administrative document control process. Changes to the sampling document are handled consistent with HASQARD (DOE/RL-96-68) and the TPA Action Plan (Ecology et al., 1989b). The OU Project Manager is responsible for tracking all SAP changes, obtaining appropriate review, and alerting DOE-RL of these changes. Appropriate documentation will follow, in accordance with the requirements for the type of change. Table 2-2 summarizes the changes that may be made and their documentation requirements.

The FWS, SMR, and appropriate BTR are responsible for ensuring that the field instructions are maintained and aligned with any revisions or approved changes to the SAP. The SMR will ensure that any deviations from the SAP are reflected in revised paperwork for the samplers and the analytical laboratory. The FWS or appropriate BTR will ensure that deviations from the SAP or problems encountered in the field are documented appropriately (e.g., in the field logbook or on nonconformance report forms) in accordance with corrective action protocols.

The OU Project Manager, FWS, or designee, is responsible for communicating field corrective action requirements and ensuring immediate corrective actions are applied to field activities. The OU Project Manager is also responsible for ensuring that a project files are maintained. The project files will contain project records or references to their storage locations. Project files may include, as appropriate, the following information:

- Operational records and logbooks
- Data forms
- Global positioning system data (a copy will be provided to SMR)
- Inspection or assessment reports and corrective action reports
- Field summary reports
- Interim progress reports
- Final reports
- Forms required by WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," and the master drilling contract

The following records are managed and maintained by SMR personnel:

- Field sampling logbooks
- Groundwater sample reports and field sample reports
- Chain-of-custody forms
- Sample receipt records
- Laboratory data packages
- Analytical data verification and validation reports

- Analytical data “case file purges” (i.e., raw data purged from laboratory files) provided by the offsite analytical laboratories

The laboratory is responsible for maintaining, and having available upon request, the following:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are controlled in accordance with work requirements and processes to ensure stored records are accurate and can be retrieved. Records required by the TPA (Ecology et al., 1989a) will be managed in accordance with the requirements therein.

Table 2-2. Change Control for Sampling Projects

Type of Change ^a	Type of Change (TPA Action Plan ^b)	Action	Documentation
Minor Change. Change has no impact on the sample or field analytical result, and little or no impact on performance or cost. Further, the change does not affect the DQOs specified in the SAP.	Minor Field Change. Changes that have no adverse effect on the technical adequacy of the job or the work schedule.	The field personnel recognizing the need for a field change will consult with the OU Project Manager prior to implementing the field change.	Minor field changes will be documented in the field logbook. The logbook entry will include the field change, the reason for the field change, and the names and titles of those approving the field change.
Significant Change. Change has a considerable effect on performance or cost, but still allow for meeting the DQOs specified in the SAP.	Minor Change. Changes to approved plans that do not affect the overall intent of the plan or schedule.	The OU Project Manager will inform the DOE-RL Project Manager and the Regulatory Lead of the change and seek concurrence at a Unit Manager’s Meeting or comparable forum. The lead regulatory agency determines there is no need to revise the document.	Documentation of this change approval would be in the Unit Manager’s Meeting minutes or comparable record such as a CN ^c .
Fundamental Change. Change has significant effect on the sample or the field analytical result, performance, or cost, and the change does not meet the requirements specified in the DQOs in the sampling document.	Revision Necessary. Lead regulatory agency determines changes to approved plans require revision to document.	If it is anticipated that a fundamental change will require the approval of the Regulatory Lead, the applicable DOE-RL Project Manager will be notified by the OU Project Manager and will be involved in the decision prior to implementation of a fundamental change.	Formal revision of the sampling document.

Table 2-2. Change Control for Sampling Projects

Type of Change^a	Type of Change (TPA Action Plan^b)	Action	Documentation
		The LRA determines the change requires a revision to the document.	
a. Consistent with DOE/RL-96-68, <i>Hanford Analytical Services Quality Assurance Requirements Documents</i> (HASQARD).			
b. Consistent with Sections 9.3 and 12.4 of the TPA Action Plan (Ecology et al., 1989b, <i>Hanford Federal Facility Agreement and Consent Order Action Plan</i>).			
c. The TPA Action Plan, Section 9.3, defines the minimum elements of a change notice.			
DOE-RL = U.S. Department of Energy-Richland Operations Office			
DQO = data quality objective			
OU = operable unit			

2.2 Data Generation and Acquisition

The following sections present the requirements for analytical methods, measurement and analysis, data collection or generation, data handling, and field and laboratory QC. The requirements for instrument calibration and maintenance, supply inspections, and data management are also addressed.

2.2.1 Analytical Methods Requirements

Analytical method performance requirements for samples collected are presented in Table 2-3. Laboratory operations and analytical services must comply with HASQARD (DOE/RL-96-68). In consultation with the laboratory and the OU Project Manager, SMR can approve changes to analytical methods as long as the new method is based upon a nationally recognized standard method (e.g., EPA, American Society for Testing and Materials [ASTM]) and the new method delivers analytical data that are comparable to those provided by the old method. The new method must achieve project DQOs as well or better than the replaced method, and is required due to the nature of the sample (e.g., high radioactivity). The laboratory using the new method must be accredited by Ecology to perform that method. Issues that may affect analytical results are resolved by SMR in coordination with the OU Project Manager.

2.2.2 Field Analytical Methods

Chemical field screening and radiological field survey data used for site characteristics will be measured in accordance with HASQARD (DOE/RL-96-68) approved method (as applicable). Field analytical methods may also be performed in accordance with the manufactures' manuals. Chapter 3 provides the parameters identified for field survey analyses.

Table 2-3. Performance Requirements for Groundwater Analysis

Constituent	CAS Number	MCL or WAC ^a	Analytical Method ^b	Required Quantitation Limit	Percent Precision	Percent Accuracy
Radionuclides (pCi/L)						
Iodine-129	15046-84-1	1	Iodine-129 liquid scintillation (low level)	1	±30	70 to 130
Strontium-90	10098-97-2	8	Gas proportional counting	2		
Technetium-99	14133-76-7	900	Technetium-99 liquid scintillation or GPC	15		
Tritium	10028-17-8	20,000	Tritium liquid scintillation (mid-level)	400		
Inorganics – Metals (µg/L)						
Uranium (Total)	7440-61-1	30	EPA 6020/200.8	0.02	±30	70 to 130
Inorganics – Anions (µg/L)						
Nitrate	14797-55-8	10,000 (as N)	Anions by IC – 300.0	250	±30	70 to 130

a. WAC 173-340-720, “Model Toxics Control Act—Cleanup,” “Groundwater Cleanup Standards,” Method B.

b. Equivalent methods may be substituted.

For EPA Method 200.8, see EPA-600/R-94/111, *Methods for the Determination of Metals in Environmental Samples, Supplement 1*. For EPA Methods 335.2 and 300.0, see EPA-600/4-79-020, *Methods for Chemical Analysis of Water and Wastes*. For four-digit EPA methods, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*.

CAS = Chemical Abstracts Service

IC = ion chromatography

EPA = U.S. Environmental Protection Agency

MCL = maximum contaminant level

GPC = gas proportional counting

WAC = Washington Administrative Code

2.2.3 Quality Control

The QC requirements specified in the SAP must be followed in the field and analytical laboratory to ensure that reliable data are obtained. Field QC samples will be collected to evaluate the potential for cross-contamination and provide information pertinent to sampling variability. Laboratory QC samples estimate the precision, bias, and matrix effects of the analytical data. Field and laboratory QC sample requirements are summarized in Table 2-4. Acceptance criteria for field QC are shown in Table 2-5.

Data will be qualified and flagged in HEIS, as appropriate.

Table 2-4. Project Quality Control Requirements

Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Field Duplicates (DUP)	1 in 20 well trips	Precision, including sampling and analytical variability
Field Splits (SPLIT)	As needed When needed, the minimum is one for every analytical method, for analyses performed where detection limit and precision and accuracy criteria have been defined in the Analytical Performance Requirements table	Precision, including sampling, analytical, and inter-laboratory
Full Trip Blanks (FTB)	1 per 20 well trips	Cross-contamination from containers or transportation
Equipment Blanks (EB)	As needed If only disposable equipment is used or equipment is dedicated to a particular well, then an equipment blank is not required Otherwise, one for every 20 samples for each media ^{a,b}	Adequacy of sampling equipment decontamination and contamination from nondedicated equipment
Analytical Quality Control^d		
Method Blanks (MBs)	1 per analytical batch ^d	Laboratory Contamination
Laboratory Duplicates	d	Laboratory Reproducibility and Precision
Matrix Spikes (MSs)	d	Matrix Effect/Laboratory Accuracy
Matrix Spike Duplicates (MSDs)	d	Laboratory Accuracy and Precision
Surrogates	d	Recovery/Yield
Tracers	d	Recovery/Yield
Laboratory Control Samples (LCSs)	1 per analytical batch ^c	Evaluate Laboratory Accuracy

a. For portable pumps, equipment blanks are collected one for every 10 well trips. Whenever a new type of nondedicated equipment is used, an equipment blank will be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination methods for the nondedicated equipment.

b. Vendor provided borehole equipment is considered dedicated equipment and EBs are not typically performed.

c. Batching across projects is allowed for similar matrices (e.g., all Hanford groundwater).

d. As defined in laboratory analysis methods.

Table 2-5. Field and Laboratory Quality Control Elements and Acceptance Criteria

Analyte ^a	Quality Control Element	Acceptance Criteria	Corrective Action
General Chemical Parameters			
Alkalinity Conductivity pH Total Dissolved Solids	MB ^b	< MDL < 5% sample concentration	Flagged with "C"
	LCS	80 – 120% recovery ^c	Data reviewed ^d
	DUP or MS/MSD	≤ 20% RPD	Data reviewed ^d
	MS ^b	75 – 125% recovery ^c	Flagged with "N"
	EB	< 2 times MDL	Flagged with "Q"
	Field Duplicate	≤ 20% RPD ^c	Flagged with "Q"
Anions			
Anions by IC	MB	< MDL < 5% sample concentration	Flagged with "C"
	LCS	80 – 120% recovery ^c	Data reviewed ^d
	DUP or MS/MSD	≤ 20% RPD	Data reviewed ^d
	MS	75 – 125% recovery ^c	Flagged with "N"
	EB, FTB	< 2X MDL	Flagged with "Q"
	Field Duplicate	≤ 20% RPD ^c	Flagged with "Q"
Metals			
Uranium	MB	< Required detection limit < 5% sample concentration	Flagged with "C"
	LCS	80 – 120% recovery ^c	Data reviewed ^d
	MS	75 – 125% recovery ^c	Flagged with "N"
	MSD	75 – 125% recovery ^c	Flagged with "N"
	MS/MSD	≤ 20% RPD	Data reviewed ^d
	EB, FTB	< 2X MDL	Flagged with "Q"
	Field Duplicate	≤ 20% RPD ^f	Flagged with "Q"

Table 2-5. Field and Laboratory Quality Control Elements and Acceptance Criteria

Analyte ^a	Quality Control Element	Acceptance Criteria	Corrective Action
Radiochemical Analyses			
Gamma Scan Iodine-129 Strontium-89/90 Technetium-99 Tritium Tritium (low level)	MB	< MDC < 5% sample concentration	Flagged with "B"
	LCS	70 – 130% recovery	Data reviewed ^d
	DUP ^c	≤ 20% RPD	Data reviewed ^d
	MS ^f	60 – 140% recovery	Flagged with "N"
	Tracer (where applicable)	20 – 105% recovery	Data reviewed ^d
	Carrier (where applicable)	30 – 105% recovery	Data reviewed ^d
	EB, FTB	< 2 times MDL	Flagged with "Q"
	Field Duplicate	≤ 20% RPD ^c	Flagged with "Q"

a. Specific analytes and method for determination are available from the Sample Management and Reporting organization.

b. Does not apply to pH, conductivity, total residue, total suspended solids, total dissolved solids, or alkalinity.

c. Determined by the laboratory based on historical data or statistically derived control limits. Limits are reported with the data. Where specific acceptance criteria are listed, those acceptance criteria may be used in place of statistically derived acceptance criteria.

d. After review, corrective actions are determined on a case-by-case basis.

e. Applies only in cases where both results are greater than 5 times the MDC or MDL.

f. Applies only to isotopic technetium-99, total uranium by inductively coupled plasma-mass spectrometry, and tritium.

DUP = laboratory matrix duplicate

MDC = minimum detectable concentration

EB = equipment blank

MDL = method detection limit

FTB = full trip blank

MS = matrix spike

LCS = laboratory control sample

MSD = matrix spike duplicate

MB = method blank

RPD = relative percent difference

2.2.3.1 Field QC Samples

Field QC samples are collected to evaluate the potential for cross-contamination and provide information pertinent to field sampling variability and laboratory performance to help ensure reliable data are obtained. Field QC samples include field duplicates, split samples, and three types of field blanks (full trip, field transfer, and equipment). Field blanks are typically prepared using high-purity reagent water. The QC sample definitions and their required frequency for collection are described in this section.

Field Duplicates (DUP): independent samples collected as close as possible to the same time and same location as the schedule sample, and are intended to be identical. DUPs are placed in separate sample containers and analyzed independently. DUPs are used to determine precision for both sampling and laboratory measurements.

Field Splits (SPLIT): two samples collected as close as possible to the same time and same location and are intended to be identical. SPLITs will be stored in separate containers and analyzed by different laboratories for the same analytes. SPLITs are inter-laboratory comparison samples used to evaluate comparability between laboratories.

Full Trip Blanks (FTB): bottles prepared by the sampling team prior to traveling to the sampling site. The preserved bottle set is either for volatile organic analysis only or identical to the set that will be collected in the field. It is filled with high-purity reagent water (or dead water from well 699-S11-E12AP for low-level tritium FTBs¹) and the bottles are sealed and transported, unopened, to the field in the same storage containers used for samples collected that day. Collected FTBs are typically analyzed for the same constituents as the samples from the associated sampling event. FTBs are used to evaluate potential contamination of the samples attributable to the sample bottles, preservative, handling, storage, and transportation.

Equipment Blanks (EB): reagent water passed through or poured over the decontaminated sampling equipment identical to the sample set collected and placed in sample containers, as identified on the SAF. The EB sample bottles are placed in the same storage containers with the samples from the associated sampling event. The EB samples will be analyzed for the same constituents as the samples from the associated sampling event. The EBs are used to evaluate the effectiveness of the decontamination process. EBs are not required for disposable sampling equipment.

2.2.3.2 Laboratory QC Samples

Internal QA/QC programs are maintained by the laboratories utilized by the project. Laboratory QA includes a comprehensive QC program that includes the use of matrix spikes (MSs), matrix duplicates (DUPs), matrix spike duplicates (MSDs), laboratory control samples (LCSs), surrogates (SUR), tracers, and method blanks (MBs). These samples are recommended in the guidance documents and are required by EPA/600/4-79-20, *Methods for Chemical Analysis of Water and Wastes*. QC checks outside of control limits are documented in analytical laboratory reports during DQAs. Laboratory QC and their typical frequencies are listed in Table 2-4. Acceptance criteria are shown in Table 2-5. The following text describes the various laboratory QC samples.

Sample Duplicate: an intra-laboratory replicate sample that is used to evaluate the precision of a method in a given sample matrix.

Matrix Spike: an aliquot of a sample spiked with a known concentration of target analyte(s). The MS is used to assess the bias of a method in a given sample matrix. Spiking occurs prior to sample preparation and analysis.

Matrix Spike Duplicate: A replicate spiked aliquot of a sample that is subjected to the entire sample preparation and analytical process. MSD results are used to determine the bias and precision of a method in a given sample matrix.

¹ Because of the low detection levels achieved in the low level tritium analysis, special low level tritium water must be used. This low-level tritium water, known as "dead water," is collected yearly, or as needed, from well 699-S11-E12AP or other approved source.

Laboratory Control Sample: a control matrix (e.g., reagent water) spiked with analytes representative of the target analytes or a certified reference material that is used to evaluate laboratory accuracy.

Method Blank: an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in the sample processing. The MB is carried through the complete sample preparations and analytical procedure. The MB is used to quantify contamination resulting from the analytical process.

Surrogate: a compound added to all samples in the analysis batch (field samples and QC samples) prior to preparation. The surrogate is typically similar in chemical composition to the analyte being determined, yet is not normally encountered. Surrogates are expected to respond to the preparation and measurement systems in a manner similar to the analytes of interest. Because surrogates are added to all standards, samples, and QC samples, they are used to evaluate overall method performance in a given matrix. Surrogates are used only in organic analyses.

Tracer: a tracer is a known quantity of radioactive isotope that is different from that of the isotope of interest but is expected to behave similarly and is added to an aliquot of sample. Sample results are generally corrected based on tracer recovery.

Sample Storage Blanks: will be used as appropriate. Storage blanks are used to monitor potential cross-contamination of samples due to improper storage conditions. This type of monitoring should be described in laboratory-specific standard operating procedures.

The laboratories are required to analyze samples within the holding time specified in Table 2-6. In some instances, constituents in the samples not analyzed within the holding times may be compromised by volatilizing, decomposing, or by other chemical changes. Data from samples analyzed outside the holding times are flagged in the HEIS database with an "H."

Table 2-6. Preservation, Container, and Holding Time Guidelines

Constituent/ Parameter	Minimum Volume	Container Type ^a	Preservation ^b	Holding Time
Miscellaneous Inorganic				
pH	60 mL	Narrow mouth poly or glass	None required	Analyze immediately
Specific Conductivity	150 mL	Narrow mouth poly or glass	Store $\leq 6^{\circ}\text{C}$	28 days
Inorganic Ions				
Nitrate	60 mL	Narrow mouth poly or glass	Store $\leq 6^{\circ}\text{C}$	48 hours
Radiochemical Analyses^c				
Iodine-129	2 \times 4L	Narrow mouth glass	None	NA
Strontium-90 (Total Beta Radiostromtium)	2 \times 1L	Narrow mouth poly or glass	Adjust pH to < 2 with HNO_3	NA
Technetium-99 by Liquid Scintillation	1L	Narrow mouth glass	Adjust pH to < 2 with HCl	NA

Table 2-6. Preservation, Container, and Holding Time Guidelines

Constituent/ Parameter	Minimum Volume	Container Type^a	Preservation^b	Holding Time
Tritium	250 mL	Narrow mouth glass	None	NA
Total Uranium by ICP/MS or ICP/AES	250 mL	Narrow mouth poly or glass	Adjust pH to < 2 with HNO ³	28 days/6 months

Note: The information in this table does not represent the EPA requirement, but is intended solely as guidance. Selection of container, preservation techniques, and applicable holding times should be based on the stated project-specific data quality objectives.

a. The term poly stands for EPA clean polyethylene bottles.

b. For preservation identified as store at ≤6°C, the sample should be protected against freezing unless it is known that freezing will not affect the sample integrity.

c. Hold times for short half-life radionuclides will be <6 half-lives. Longer-lived radionuclides should be analyzed within 6 months.

EPA = U.S. Environmental Protection Agency

NA = not applicable

2.2.4 Measurement Equipment

Each user of the measuring equipment is responsible to ensure the equipment is functioning as expected, properly handled, and properly calibrated at required frequencies in accordance with methods governing control of the measuring equipment. Onsite environmental instrument testing, inspection, calibration, and maintenance will be recorded in accordance with approved methods. Field screening instruments will be used, maintained, and calibrated in accordance with the manufacturer's specifications and other approved methods.

2.2.5 Instrument and Equipment Testing, Inspection, and Maintenance

Collection, measurement, and testing equipment should meet applicable standards (e.g., ASTM) or have been evaluated as acceptable and valid in accordance with instrument-specific methods, requirements, and specifications. Software applications will be acceptance tested prior to use in the field.

Measurement and testing equipment used in the field or in the laboratory will be subject to preventive maintenance measures to ensure minimization of downtime. Laboratories must maintain and calibrate their equipment. Maintenance requirements (e.g., documentation of routine maintenance) will be included in the individual laboratory and onsite organization's QA plan or operating protocols, as appropriate. Maintenance of laboratory instruments will be performed in a manner consistent with maintenance requirements specified in HASQARD (DOE/RL-96-68) and applicable Hanford Site requirements.

2.2.6 Instrument/Equipment Calibration and Frequency

Specific field equipment calibration information is provided in Section 3.3. Analytical laboratory instruments are calibrated in accordance with the laboratory's QA plan and in accordance with HASQARD (DOE/RL-96-68).

2.2.7 Inspection/Acceptance of Supplies and Consumables

Consumables, supplies, and reagents will be reviewed in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*, requirements

and will be appropriate for their use. Supplies and consumables used in support of sampling and analysis activities are procured in accordance with internal work requirements and processes. Responsibilities and interfaces necessary to ensure that items procured/acquired for the contractor meet the specific technical and quality requirements must be in place. The procurement system ensures purchased items comply with applicable procurement specifications. Supplies and consumables are checked and accepted by users prior to use.

2.2.8 Non-Direct Measurements

Data obtained from sources such as computer databases, programs, literature files, and historical databases will be technically reviewed to the same extent as the data generated as part of any sampling and analysis QA/QC effort. All data used in evaluations will be identified by source.

2.2.9 Data Management

The SMR organization, in coordination with the OU Project Manager, is responsible for ensuring that analytical data are appropriately reviewed, managed, and stored in accordance with the applicable programmatic requirements governing data management methods.

Electronic data access, when appropriate, will be through a Hanford Site database (e.g., HEIS) or a project-specific database, whichever is applicable for the data being stored. Where electronic data are not available, hard copies will be provided in accordance with Section 9.6 of the TPA Action Plan (Ecology et al., 1989b).

Laboratory errors are reported to the SMR organization on a routine basis. For reported laboratory errors, a sample issue resolution form will be initiated in accordance with applicable methods. This process is used to document analytical errors and to establish their resolution with the OU Project Manager. The sample issue resolution forms become a permanent part of the analytical data package for future reference and for records management.

2.3 Assessment and Oversight

The elements in assessment and oversight address the effectiveness of project implementation and associated QA and QC activities. The purpose of assessment is to ensure that the QAPjP is implemented as prescribed.

2.3.1 Assessments and Response Actions

Random surveillances and assessments verify compliance with the requirements outlined in this integrated SAP, OU-specific addenda, project field instructions, the project quality management plan, methods, and regulatory requirements. Deficiencies identified by these assessments will be reported in accordance with existing programmatic requirements. The project's line management chain coordinates the corrective actions/deficiencies resolutions in accordance with the QA program, the corrective action management program, and associated methods implementing these programs. When appropriate, corrective actions will be taken by the OU Project Manager (or designee).

Oversight activities in the analytical laboratories, including corrective action management, are conducted in accordance with the laboratories' QA plans. The contractor oversees offsite analytical laboratories and verifies the laboratories are qualified for performing Hanford Site analytical work.

2.3.2 Reports to Management

Management will be made aware of deficiencies identified by self-assessments, corrective actions from ECOs, and findings from QA assessments and surveillances. Issues reported by the laboratories are

communicated to the SMR organization, which then initiates a sample issue resolution form. This process is used to document analytical or sample issues and to establish resolution with the OU Project Manager.

2.4 Data Review, Verification, and Usability

This section addresses the QA activities that occur after data collection. Implementation of these activities determines whether the data conform to the specified criteria, thus satisfying the project objectives.

2.4.1 Data Review and Verification

Data review and verification are performed to confirm that sampling and chain-of-custody documentation are complete. This review includes linking sample numbers to specific sampling locations, reviewing sample collection dates and sample preparation and analysis dates to assess whether holding times have been met, and reviewing QC data to determine whether analyses have met the data quality requirements specified in this SAP.

The criteria for verification include, but are not limited to, review for contractual compliance (samples were analyzed as requested), use of the correct analytical method, transcription errors, correct application of dilution factors, appropriate reporting of dry weight versus wet weight, and correct application of conversion factors.

Errors identified by the laboratories are reported to the SMR organization's project coordinator, who initiates a sample issue resolution form. This process is used to document analytical errors and to establish resolution with the OU Technical Lead.

Relative to analytical data in sample media, field screening results are of lesser importance in making inferences regarding risk. Field QA/QC results will be reviewed to ensure they are usable.

The OU Technical Lead data review will help determine if observed changes reflect improved/degraded groundwater quality or potential data errors and may submit a request for data review (RDR) on questionable data. The laboratory may be asked to check calculations or re-analyze the sample, or the well may be resampled. Results of the RDR process are used to flag the data appropriately in the HEIS database and/or to add comments.

2.4.2 Data Validation

Data validation activities will be performed at the discretion of the OU Project Manager and under the direction of SMR.

2.4.3 Reconciliation with User Requirements

The DQA process compares completed field sampling activities to those proposed in corresponding sampling documents and provides an evaluation of the resulting data. The purpose of the DQA is to determine whether quantitative data are of the correct type and are of adequate quality and quantity to meet the project DQOs. For routine groundwater monitoring undertaken through this integrated SAP, the DQA is captured in QC associated with the Annual Groundwater Report, evaluating field and lab QC and the usability of data. Further DQAs will be performed at the discretion of the OU Project Manager and documented in a report overseen by SMR.

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3 Field Sampling Plan

This chapter lists the groundwater wells to be monitored, the sampling frequency, and the constituents to be analyzed.

3.1 Sampling Objectives

The objectives of groundwater monitoring in this OU are to define the extent and track the movement of the groundwater contaminant plumes in the unconfined aquifer. These objectives are accomplished in the field by sampling groundwater at designated wells and analyzing the samples for the COPCs and supporting constituents.

3.2 Sample Location, Frequency, and Constituents to be Monitored

The groundwater monitoring wells comprising the 200-PO-1 OU Near Field and Far Field networks are listed in Tables 3-1 and 3-2. Monitoring locations are shown in Figures 3-1 and 3-2. Tables 3-3 and 3-4 list the specific constituents to be analyzed and the sampling frequency for those wells that have been selected for monitoring. The criteria that were used to identify the wells to be used to monitor each of the COPCs and associated contaminant plumes and to determine the sampling frequency to be employed, is provided in Appendix A on Tables A3-1 through A3-6. Some wells are co-sampled with other monitoring programs (e.g., waste sites monitored under RCRA or WAC requirements). Monitoring requirements for those wells are described in separate plans.

3.2.1 Monitoring Network

This SAP organizes the wells within the 200-PO-1 Groundwater OU according to their proximity to the sources of the major contaminant plumes in the southeast portion of the 200 East Area. Wells located close to the contaminant sources (e.g., near the PUREX Cribs) are referred to as Near Field wells. The other wells located farther from the contaminant sources (e.g., outside of the 200 East Area) are termed Far Field wells.

Several smaller subsidiary groundwater monitoring networks exist within the 200-PO-1 Groundwater OU Area besides the larger network described in this SAP. These subsidiary networks (including seven RCRA TSD facilities and one SWL) are monitored under separate site-specific groundwater monitoring plans. The reported data from these networks is supplementary to information gathered under this SAP.

Of the 125 wells identified for potential use in monitoring network within the 200-PO-1 OU, 120 wells are screened or open to the unconfined aquifer and 5 wells are open to the interval below the LMU of the Ringold Formation (and above the underlying basalt) where the aquifer is often confined locally. Not all wells in the 200-PO-1 OU network will need to be utilized for contaminant plume monitoring.

An analysis of the network to identify those wells needed for use in monitoring specific COPC plumes is presented in Appendix A Tables A3-1 through A3-6. Those wells selected for use in monitoring the 200-PO-1 OU COPCs are presented in Tables 3-3 and 3-4 and shown on Figures 3-3 through 3-10.

Table 3-1. Wells within the Near Field Area Monitoring Network

299-E16-2	299-E17-26	299-E25-2	299-E25-32P	299-E25-47
299-E17-1	299-E18-1	299-E25-3	299-E25-32Q	299-E25-48
299-E17-12	299-E23-1	299-E25-6	299-E25-34	299-E25-93
299-E17-13	299-E24-5	299-E25-17	299-E25-35	299-E25-94
299-E17-14	299-E24-16	299-E25-18	299-E25-36	299-E26-4
299-E17-16	299-E24-18	299-E25-19	299-E25-37	299-E26-12
299-E17-18	299-E24-20	299-E25-20	299-E25-39	299-E26-13
299-E17-19	299-E24-21	299-E25-22	299-E25-40	699-37-43
299-E17-21	299-E24-22	299-E25-26	299-E25-41	699-37-47A
299-E17-22	299-E24-23	299-E25-28	299-E25-42	699-43-44
299-E17-23	299-E24-24	299-E25-29P	299-E25-43	699-43-45
299-E17-25	299-E24-33	299-E25-29Q	299-E25-44	

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Table 3-2. Wells within the Far Field Area Monitoring Network

299-E13-5	699-10-E12	699-28-40	699-40-33A	699-48-7A
299-E13-11	699-14-38	699-29-4	699-40-36	699-49-13E
299-E13-14	699-17-5	699-31-11	699-41-1A	699-52-19
299-E13-19	699-19-43	699-31-31	699-41-23	699-S12-3
499-S0-7	699-20-20	699-32-22A	699-41-40	699-S19-E13
499-S0-8	699-20-E120	699-32-43	699-41-42	699-S19-E14
499-S1-8J	699-20-E12S	699-33-56	699-42-12A	699-S3-25
699-2-3	699-20-E5A	699-34-41B	699-42-39A	699-S3-E12
699-2-6A	699-21-6	699-34-42	699-42-39B	699-S6-E14A
699-2-7	699-22-35	699-35-9	699-42-42B	699-S8-19
699-8-17	699-24-46	699-37-E4	699-43-3	
699-8-25	699-26-15A	699-38-15	699-46-21B	
699-9-E2	699-26-33	699-39-39	699-46-4	
699-10-54A	699-26-35A	699-40-1	699-47-5	

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Table 3-3. Sampling and Analysis Schedule for 200-PO-1 Groundwater Operable Unit Near Field Wells

Well ID	Well Number	Co-Sample	Comments	WAC Compliant ^a	Iodine-129	Nitrate	Strontium-90	Technetium-99	Tritium	Uranium	Field Parameters ^b	Other ^c
A5878	299-E16-2			N/1960	A	BA ₁			BA ₁		A/BA ₁	
A4728	299-E17-1			N/1955	A	A		T ₁	A		A/T ₁	
A4730	299-E17-12			N/1986		A			T ₂		A/T ₂	
A4731	299-E17-13			N/1986	BA ₂	T ₁			T ₁		BA ₂ /T ₁	
A4732	299-E17-14	RCRA 216-A-36B		C/1988	A	A	A	T ₂	A	A	A/T ₂	
A4734	299-E17-16	RCRA 216-A-36B		C/1988	A	T ₃	BA ₂		T ₃	A	A/BA ₂ /T ₃	
A4736	299-E17-18	RCRA 216-A-36B		C/1988	BA ₁	A	BA ₁		T ₂		A/BA ₁ /T ₂	
A4737	299-E17-19	RCRA 216-A-36B		C/1988	T ₃	A	BA ₁	T ₃	A	A	A/BA ₁ /T ₃	
B8500	299-E17-21			C/1998		A			BA ₂		A/BA ₂	
C3826	299-E17-22	IDF		C/2002	BA ₁	A			T ₁		A/BA ₁ /T ₁	
C3827	299-E17-23	IDF		C/2002		A			A		A	
C3926	299-E17-25	IDF		C/2002		A			A		A	
C4648	299-E17-26	IDF		C/2005		A			A		A	
A4743	299-E18-1	IDF		C/1988		BA ₂					BA ₂	
A4747	299-E23-1			N/1948	BA ₂	A			T ₃		A/BA ₂ /T ₃	
A5899	299-E24-5			N/1956	BA ₁	BA ₁			T ₂		BA ₁ /T ₂	
A4751	299-E24-16			C/1988	A	T ₁	BA ₂		T ₁	A	A/BA ₂ /T ₁	
A4753	299-E24-18			C/1988	BA ₂	T ₂			A		A/BA ₂ /T ₂	
A4756	299-E24-20	RCRA A-AX (AEA)		C/1991	T ₂	A		(Q)			(Q)/A/T ₂	
C3177	299-E24-21	IDF		C/2001	BA ₁	BA ₂			A		A/BA _{1,2}	

Table 3-3. Sampling and Analysis Schedule for 200-PO-1 Groundwater Operable Unit Near Field Wells

Well ID	Well Number	Co-Sample	Comments	WAC Compliant ^a	Iodine-129	Nitrate	Strontium-90	Technetium-99	Tritium	Uranium	Field Parameters ^b	Other ^c
C4123	299-E24-22	RCRA A-AX (AEA)		C/2003	A	A		(Q)			(Q)/A	
C5301	299-E24-23			C/2007	T ₁	A	BA ₁		A	A	A/BA ₁ /T ₁	
C4647	299-E24-24	IDF		C/2005		BA ₂			BA ₂		BA ₂	
C4257	299-E24-33	RCRA A-AX (AEA)		C/2004	A	A		(Q)			(Q)/A	
A4766	299-E25-2	RCRA A-AX (AEA)		N/1955	BA ₁	A		(Q)			(Q)/A/BA ₁	
A6024	299-E25-3			N/1954	BA ₂	BA ₂			BA ₁	BA ₁	BA _{1,2}	
A4796	299-E25-6			N/1956	T ₃				BA ₁		BA ₁ /T ₃	
A6031	299-E25-17	RCRA 216-A-37-1		N/1976	T ₁	A		BA ₁	BA ₂		A/BA _{1,2} /T ₁	
A4764	299-E25-18			N/1976	A	A			BA ₁		A/BA ₁	
A4765	299-E25-19	RCRA 216-A-37-1		N/1976	T ₂	A		BA ₂	BA ₂		A/BA ₂ /T ₂	
A4767	299-E25-20	RCRA 216-A-37-1		N/1976	T ₃	A			BA ₂		A/BA ₂ /T ₃	
A6032	299-E25-22			N/1983	BA ₁	BA ₁			A		A/BA ₁	
A4771	299-E25-26	RCRA 216-A-29		N/1985	T ₁						T ₁	
A4773	299-E25-28	RCRA 216-A-29	LU	N/1986	A				BA ₂		A/BA ₂	
A4774	299-E25-29P		TU	N/UN	A	A			BA ₁		A/BA ₁	
A4775	299-E25-29Q		MU	N/UN	A	A			BA ₁		A/BA ₁	
A4779	299-E25-32P	RCRA 216-A-29	TU	C/1988	A	BA ₁					A/BA ₁	
A4780	299-E25-32Q		LU	C/1988	A	BA ₁					A/BA ₁	
A4782	299-E25-34	RCRA 216-A-29		C/1988	A						A	
A4783	299-E25-35	RCRA 216-A-29		C/1988	T ₁				BA ₁		BA ₁ /T ₁	

Table 3-3. Sampling and Analysis Schedule for 200-PO-1 Groundwater Operable Unit Near Field Wells

Well ID	Well Number	Co-Sample	Comments	WAC Compliant ^a	Iodine-129	Nitrate	Strontium-90	Technetium-99	Tritium	Uranium	Field Parameters ^b	Other ^c
A4784	299-E25-36			C/1988	A	A			A	A	A	
A4785	299-E25-37			C/1989	T ₂						T ₂	
A4787	299-E25-39			C/1990	BA ₁				BA ₂		BA _{1,2}	
A4789	299-E25-40	RCRA A-AX (AEA)		C/1989	A	BA ₂		(Q)			(Q)/A/BA ₂	
A4790	299-E25-41	RCRA A-AX (AEA)		C/1989	BA ₂	A		(Q)			(Q)/A/BA ₂	
A4791	299-E25-42			C/1991	A	BA ₁		BA ₁			A/BA ₁	
A4792	299-E25-43			C/1991	T ₃				BA ₁		BA ₁ /T ₃	
A5448	299-E25-44			C/1992	BA ₂	BA ₂			T ₃		BA ₂ /T ₃	
A4794	299-E25-47	RCRA 216-A-37-1		C/1992	T ₁	A			BA ₂		A/BA ₂ /T ₁	
A4795	299-E25-48	RCRA 216-A-29		C/1992	T ₂	A					A/T ₂	
C4122	299-E25-93	RCRA A-AX (AEA)		C/2003	A	A	T ₃	(Q)			(Q)/A/T ₃	
C4665	299-E25-94	RCRA A-AX (AEA)		C/2004	A	A	T ₁	(Q)			(Q)/A/T ₁	
A4804	299-E26-4			N/1958	T ₃				A		A/T ₃	
A6028	299-E26-12	RCRA 216-A-29		N/1960	T ₁						T ₁	
A4762	299-E26-13	RCRA 216-A-29		N/1963	T ₂						T ₂	
A5146	699-37-43			N/1955	T ₃				T ₃		T ₃	
B2822	699-37-47A			C/1996	A	A	T ₂	T ₂	T ₂	BA ₂	A/BA ₂ /T ₂	
B8758	699-43-44			C/1999	BA ₂				T ₁		BA ₂	
A5180	699-43-45	RCRA 216-A-29		C/1989	BA ₁						BA ₁	

Table 3-3. Sampling and Analysis Schedule for 200-PO-1 Groundwater Operable Unit Near Field Wells

Well ID	Well Number	Co-Sample	Comments	WAC Compliant ^a	Iodine-129	Nitrate	Strontium-90	Technetium-99	Tritium	Uranium	Field Parameters ^b	Other ^c
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a. Includes year of construction if available.

b. Field parameters include pH, dissolved oxygen, specific conductance, temperature, and turbidity.

c. Other = Additional analysis (utilized for a limited duration as needed for specific data collection needs).

A = To be sampled annually

BA = To be sampled biennially

Q = To be sampled quarterly

T = To be sampled triennially

(Q) AEA monitoring for technetium-99 is required quarterly at WMA A/AX (PNNL-15315, *RCRA Assessment Plan for Single-Shell Tank Waste Management Area A-AX at the Hanford Site*).

Triennial wells used for monitoring each COPC are divided into three groups with selected wells sampled each year within a 3-year rotational cycle. The cycle will begin on the first year this plan is implemented. First year triennial wells designated T₁, second year T₂ and third year T₃.

Wells designated for biennial sampling for each COPC are be divided into two groups with one group sampled on odd calendar years (BA₁) and the other on even calendar years (BA₂). Biennial sampling will begin on the first year this plan is implemented.

C = Well construction is compliant with WAC 173-160 resource protection requirements, includes year of construction if available.

LU = Lower unconfined aquifer

MU = Middle unconfined aquifer

N = Well construction is not compliant with WAC 173-160 resource protection requirements, includes year of construction if available.
WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells."

IDF = Integrated Disposal Facility

RCRA = *Resource Conservation and Recovery Act of 1976*

TU = Top of unconfined aquifer

WAC = *Washington Administrative Code*

Table 3-4. Sampling and Analysis Schedule for 200-PO-1 Groundwater Operable Far Field Wells

Well ID	Well Number	Co-Sample	Comments	WAC Compliant ^a	Iodine-129	Nitrate	Strontium-90	Technetium-99	Tritium	Uranium	Field Parameters ^b	Other ^c
A8098	499-S0-7		FFTF (MU)	N/1972					T ₂		T ₂	
A8099	499-S0-8		FFTF - Water supply well (MU)	N/1972					T ₂		T ₂	
A8114	499-S1-8J		FFTF - Water supply well (LU)	N/1985					T ₂		T ₂	
A5078	699-2-3			N/1950					T ₂		T ₂	
B8077	699-2-6A			C/1997					T ₂		T ₂	
A8122	699-2-7			N/1978					T ₂		T ₂	
A5333	699-8-17			N/1950	T ₃				T ₂		T _{2,3}	
A5334	699-8-25			N/1971	T ₃				T ₂		T _{2,3}	
A5349	699-9-E2			N/1958					T ₂		T ₂	
A5065	699-10-E12			N/1962					T ₂		T ₂	
A5068	699-14-38			N/1958					T ₂		T ₂	
A5073	699-17-5			N/1950					T ₂		T ₂	
A5080	699-20-20			N/1948	T ₃				T ₂		T _{2,3}	
A9613	699-20-E12O		TU	N/1961					T ₂		T ₂	
A9617	699-20-E12S		MU	N/1962					T ₂		T ₂	
A8428	699-20-E5A			N/1976					T ₂		T ₂	
A8438	699-21-6			N/1979	T ₃				T ₂		T _{2,3}	
A5100	699-26-15A			N/1958	T ₃				T ₂		T _{2,3}	
A5101	699-26-33	RCRA-NRDWL		C/1986	T ₃				T ₂		T _{2,3}	
A5103	699-26-35A	RCRA-NRDWL, SWL		C/1986	T ₃				T ₂		T _{2,3}	

Table 3-4. Sampling and Analysis Schedule for 200-PO-1 Groundwater Operable Far Field Wells

Well ID	Well Number	Co-Sample	Comments	WAC Compliant ^a	Iodine-129	Nitrate	Strontium-90	Technetium-99	Tritium	Uranium	Field Parameters ^b	Other ^c
A5110	699-28-40			N/1956	T ₃				T ₂		T _{2,3}	
A8490	699-29-4			N/1979	T ₃				T ₂		T _{2,3}	
A8503	699-31-11			N/1980	T ₃				T ₂		T _{2,3}	
A5123	699-31-31			N/1956	T ₃				T ₂		T _{2,3}	
A5126	699-32-22A			N/1971	T ₃				T ₂		T _{2,3}	
A5127	699-32-43			N/1968	T ₃				T ₂		T _{2,3}	
A5133	699-33-56			N/1958					T ₂		T ₂	
A5135	699-34-41B			N/1970	T ₃				T ₂		T _{2,3}	
A5136	699-34-42			N/1970	T ₃				T ₂		T _{2,3}	
A5142	699-35-9			N/1950	T ₃				T ₂		T _{2,3}	
A8588	699-37-E4			N/1982					T ₂		T ₂	
A8594	699-38-15			N/1979	T ₃				T ₂		T _{2,3}	
A5150	699-39-39		CR	N/1970		BA ₂			T ₂		BA ₂ /T ₂	
A5152	699-40-1			N/1961					T ₂		T ₂	
A5153	699-40-33A			N/1949	T ₃						T ₃	
A8646	699-41-1A			N/1979					T ₂		T ₂	
A5159	699-41-23			N/1948	T ₃				T ₂		T _{2,3}	
A5161	699-41-40		CR	C/1989	T ₃				T ₂		T _{2,3}	
A5162	699-41-42			C/1992	BA ₁				T ₂		BA ₁ /T ₂	
A5163	699-42-12A			N/1957	T ₃				T ₂		T _{2,3}	
A5165	699-42-39A			C/1991					T ₂		T ₂	
A5166	699-42-39B		CR	C/1991					T ₂		T ₂	

Table 3-4. Sampling and Analysis Schedule for 200-PO-1 Groundwater Operable Far Field Wells

Well ID	Well Number	Co-Sample	Comments	WAC Compliant ^a	Iodine-129	Nitrate	Strontium-90	Technetium-99	Tritium	Uranium	Field Parameters ^b	Other ^c
A5171	699-42-42B	RCRA-B Pond	CR	C/1988	BA ₂				T ₂		BA ₂ /T ₂	
A8677	699-43-3			N/1979	T ₃				T ₂		T _{2,3}	
A5197	699-46-21B			N/1955	T ₃				T ₂		T _{2,3}	
A8726	699-46-4			N/1979					T ₂		T ₂	
A8744	699-47-5			N/1979					T ₂		T ₂	
A5213	699-48-7A			N/1943					T ₂		T ₂	
A5215	699-49-13E			N/1944					T ₂		T ₂	
A5233	699-52-19			N/1944					T ₂		T ₂	
A5366	699-S12-3			N/1950					T ₂		T ₂	
A5373	699-S3-25			N/1971					T ₂		T ₂	
A5408	699-S8-19			N/1950					T ₂		T ₂	

a. Includes year of construction if available.

b. Field Parameters include: pH, dissolved oxygen, specific conductance, temperature, turbidity.

c. Other = Additional analysis (utilized for a limited duration, as needed, for specific data collection needs).

A = To be sampled annually

BA = To be sampled biennially

T = To be sampled triennially

Triennial wells used for monitoring each COPC are divided into three groups with selected wells sampled each year within a 3-year rotational cycle. The cycle will begin on the first year this plan is implemented. First year triennial wells designated T₁, second year T₂ and third year T₃.

Wells designated for biennial sampling for each COPC are be divided into two groups with one group sampled on odd calendar years (BA₁) and the other on even calendar years (BA₂). Biennial sampling will begin on the first year this plan is implemented.

C = Well construction is compliant with WAC 173-160 resource protection requirements.

N = Well construction is not compliant with WAC 173-160 resource protection requirements.

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells."

CR = confined Ringold

Table 3-4. Sampling and Analysis Schedule for 200-PO-1 Groundwater Operable Far Field Wells

Well ID	Well Number	Co-Sample	Comments	WAC Compliant ^a	Iodine-129	Nitrate	Strontium-90	Technetium-99	Tritium	Uranium	Field Parameters ^b	Other ^c
FFTF	=	Fast Flux Test Facility										
FY	=	fiscal year										
LU	=	lower unconfined aquifer										
MU	=	middle unconfined aquifer										
NRDWL	=	Nonradioactive Dangerous Waste Landfill										
RCRA	=	<i>Resource Conservation and Recovery Act of 1976</i>										
TU	=	top of unconfined aquifer										
SWL	=	Solid Waste Landfill										
WAC	=	<i>Washington Administrative Code</i>										

1 **3.2.1.1 Near Field Wells**

2 Near Field wells within the 200-PO-1 Groundwater OU network include 59 wells located close to sources
3 of the major groundwater contamination plumes in the southeast portion of the 200 East Area (Table 3-1
4 and Figure 3-1). Some of the wells in the other subsidiary networks are co-sampled with the 200-PO-1
5 Groundwater OU, and provide supplementary data. The RCRA TSD facilities include the 216-A-36B and
6 216-A-37-1 Cribs, WMA A-AX, 216-A-29 Ditch, B Pond, and IDF. Those wells selected to be used for
7 monitoring, constituents to be sampled, and sampling frequency are identified on Table 3-3. Criteria used
8 to identify wells needed for monitoring and to establish monitoring frequency are presented in Appendix
9 A for each of the COPCs. The resulting monitoring wells selected and the frequency of sampling to be
10 utilized for each COPC plume are presented in Table 3-3 are graphically shown in Figures 3-3, 3-4, 3-6,
11 3-8, 3-9, and 3-10.

12 **3.2.1.2 Far Field Wells**

13 The Far Field monitoring network, which extends beyond the 200 East Area, comprises 66 wells
14 (Table 3-2). Five of these wells are used to monitor contaminant concentrations within the
15 Ringold-confined aquifer. The primary use of the Far Field wells is to track the major groundwater
16 contaminant plumes beyond the 200 East Area, monitor groundwater constituents near the Columbia
17 River and monitor groundwater near the BC Cribs. Far Field wells are primarily used for analysis of
18 iodine-129 and tritium. Criteria used for well selection and to establish monitoring frequency for each of
19 the COPCs are presented in Appendix A. The resulting monitoring wells selected and the frequency of
20 sampling to be utilized for each COPC plume are presented in Table 3-4 and graphically shown in Figures
21 3-5 and 3-7.

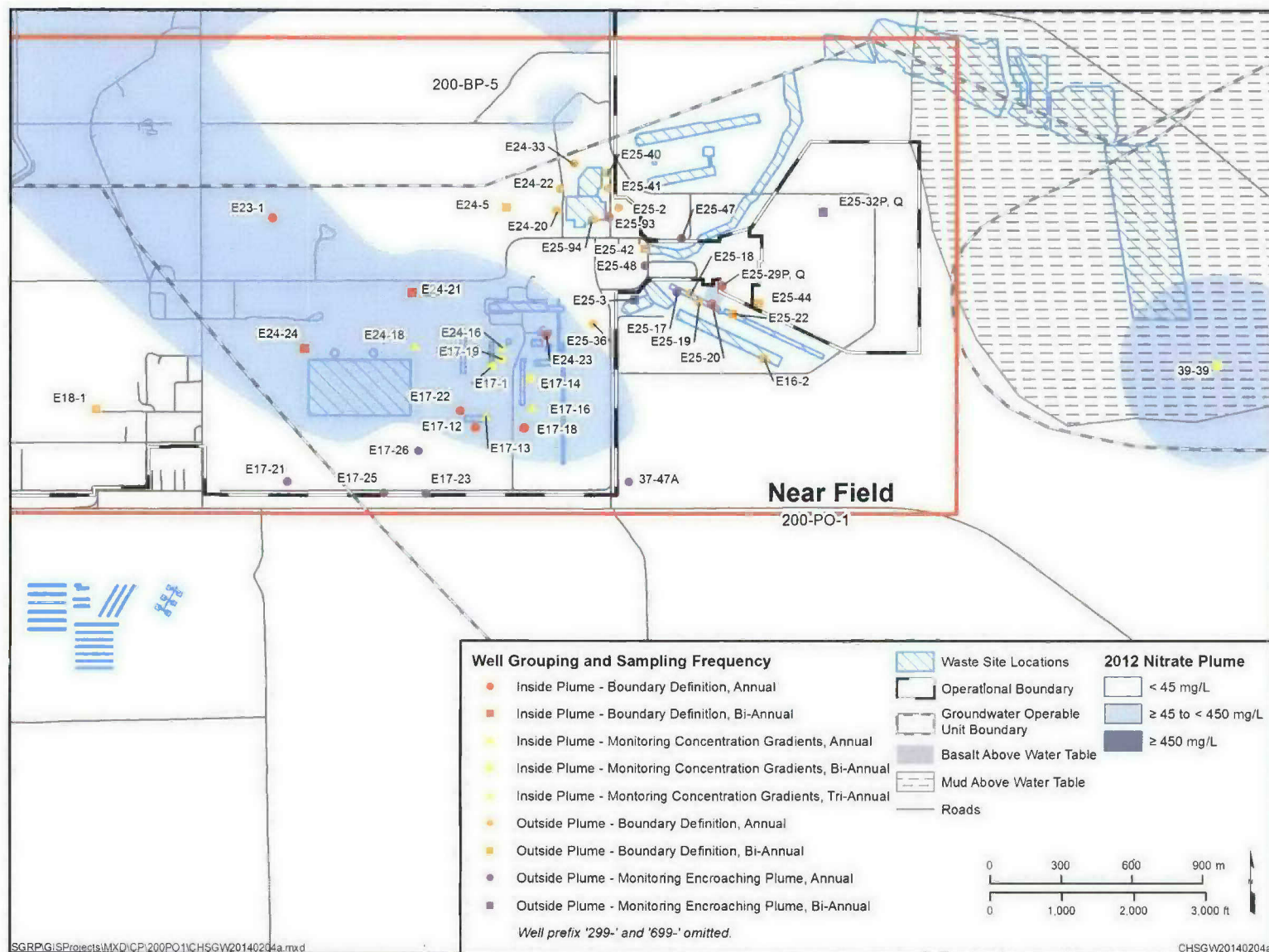


Figure 3-3. 200-PO-1 Near Field Well Network for Nitrate Plume Monitoring



Figure 3-4. 200-PO-1 Near Field Well Network for Iodine-129 Plume Monitoring

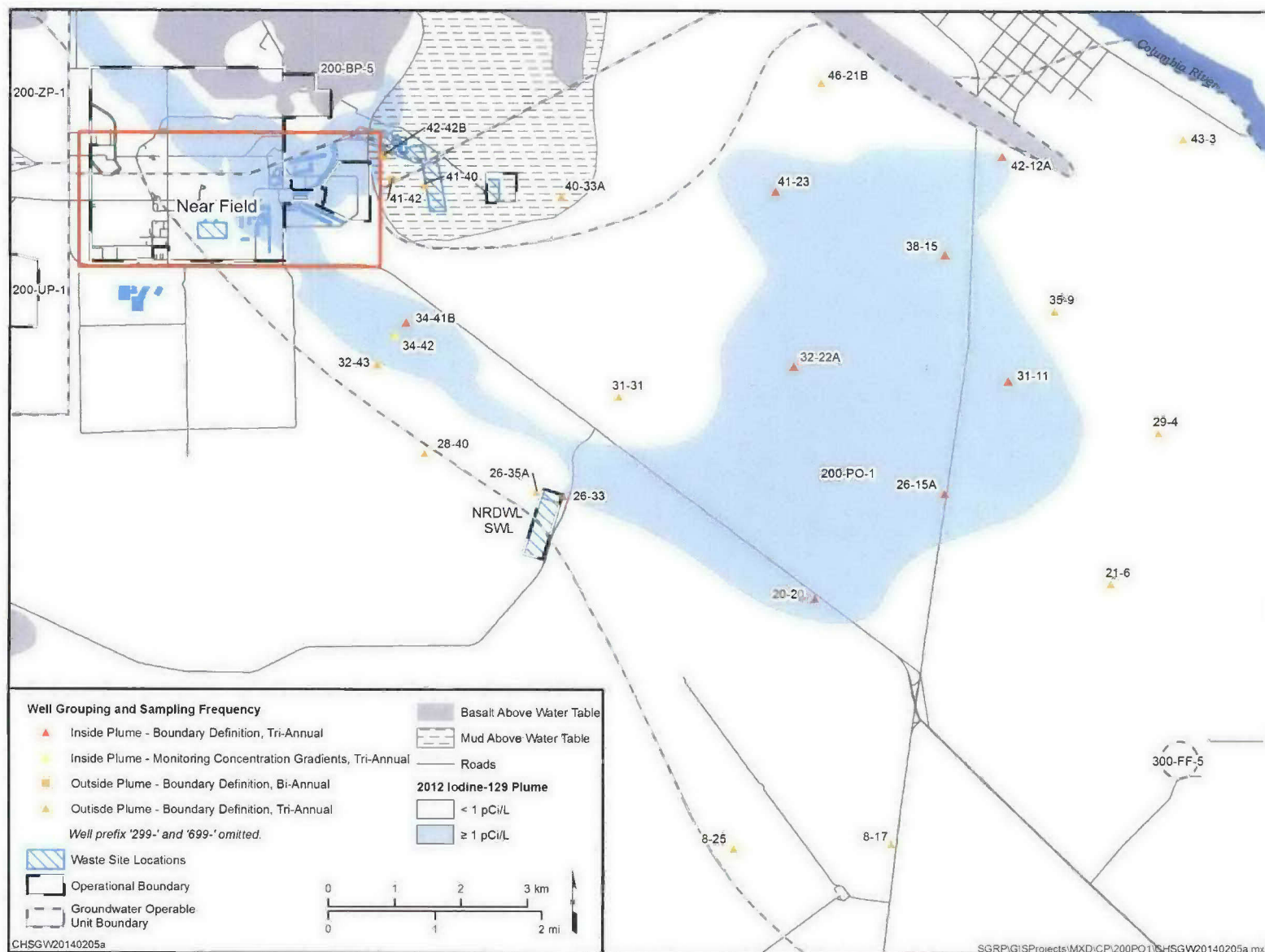


Figure 3-5. 200-PO-1 Far Field Well Network for Iodine-129 Plume Monitoring

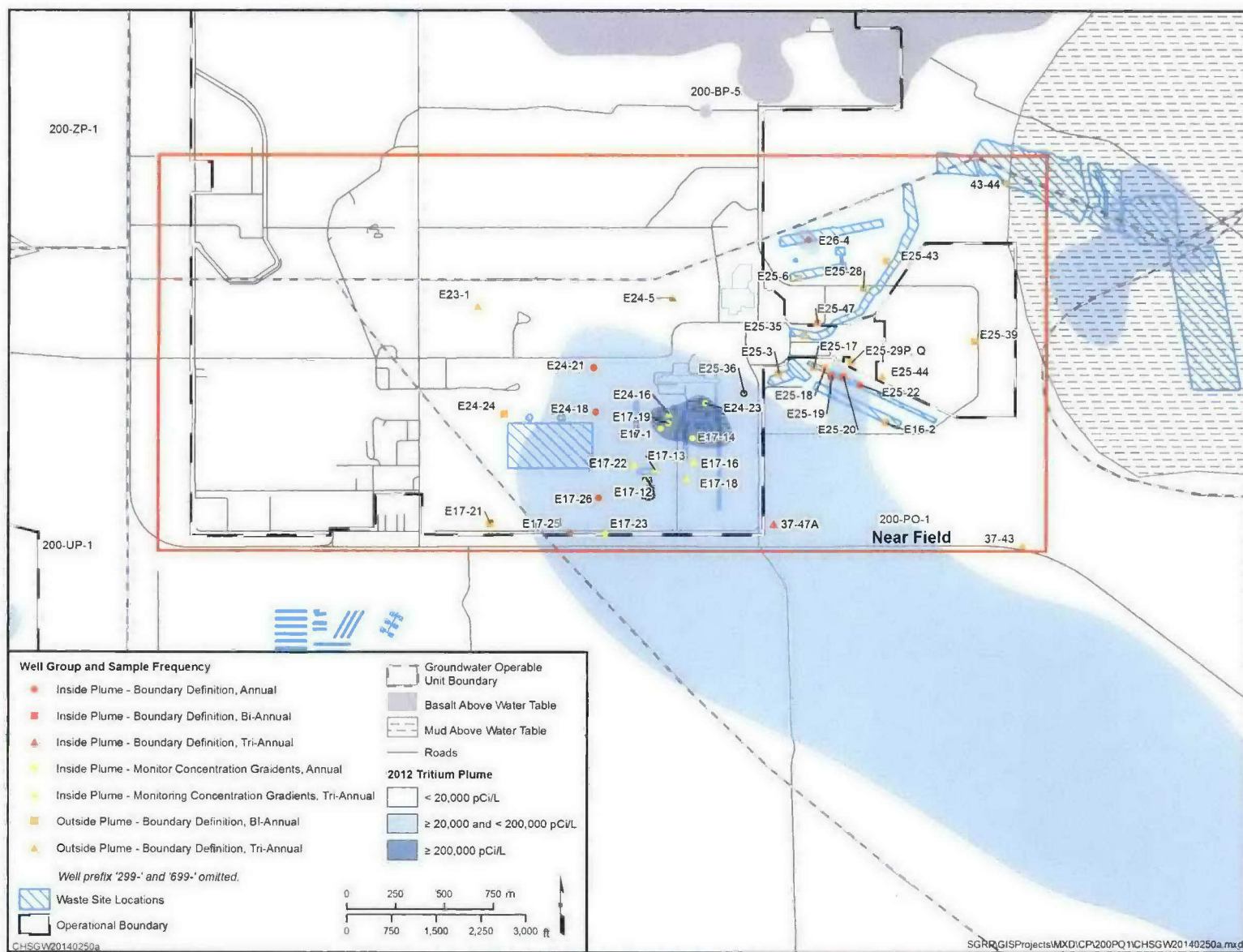


Figure 3-6. 200-PO-1 Near Field Well Network for Tritium Plume Monitoring

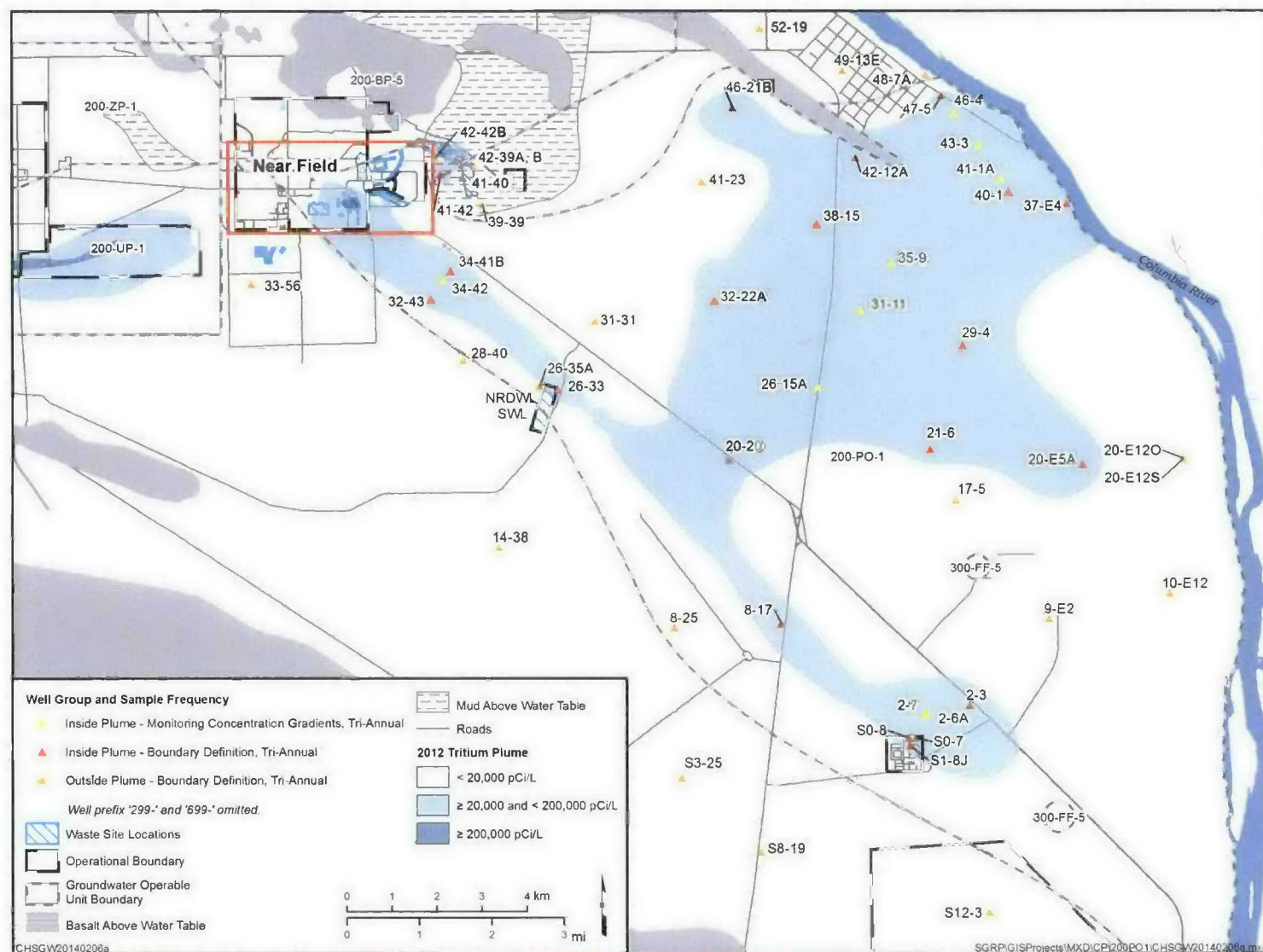


Figure 3-7. 200-PO-1 Far Field Well Network for Tritium Plume Monitoring

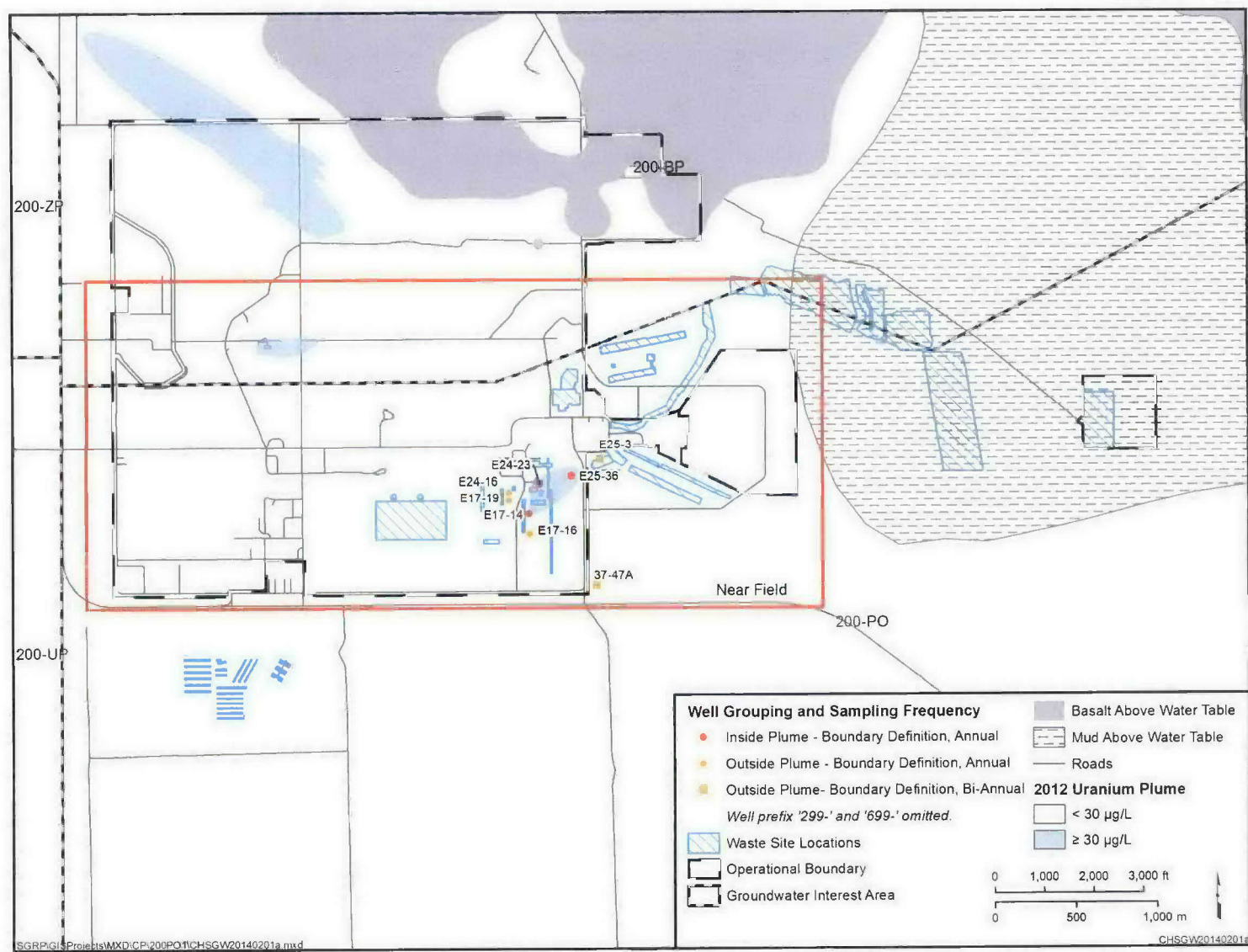


Figure 3-8. 200-PO-1 Well Network for Uranium Plume Monitoring

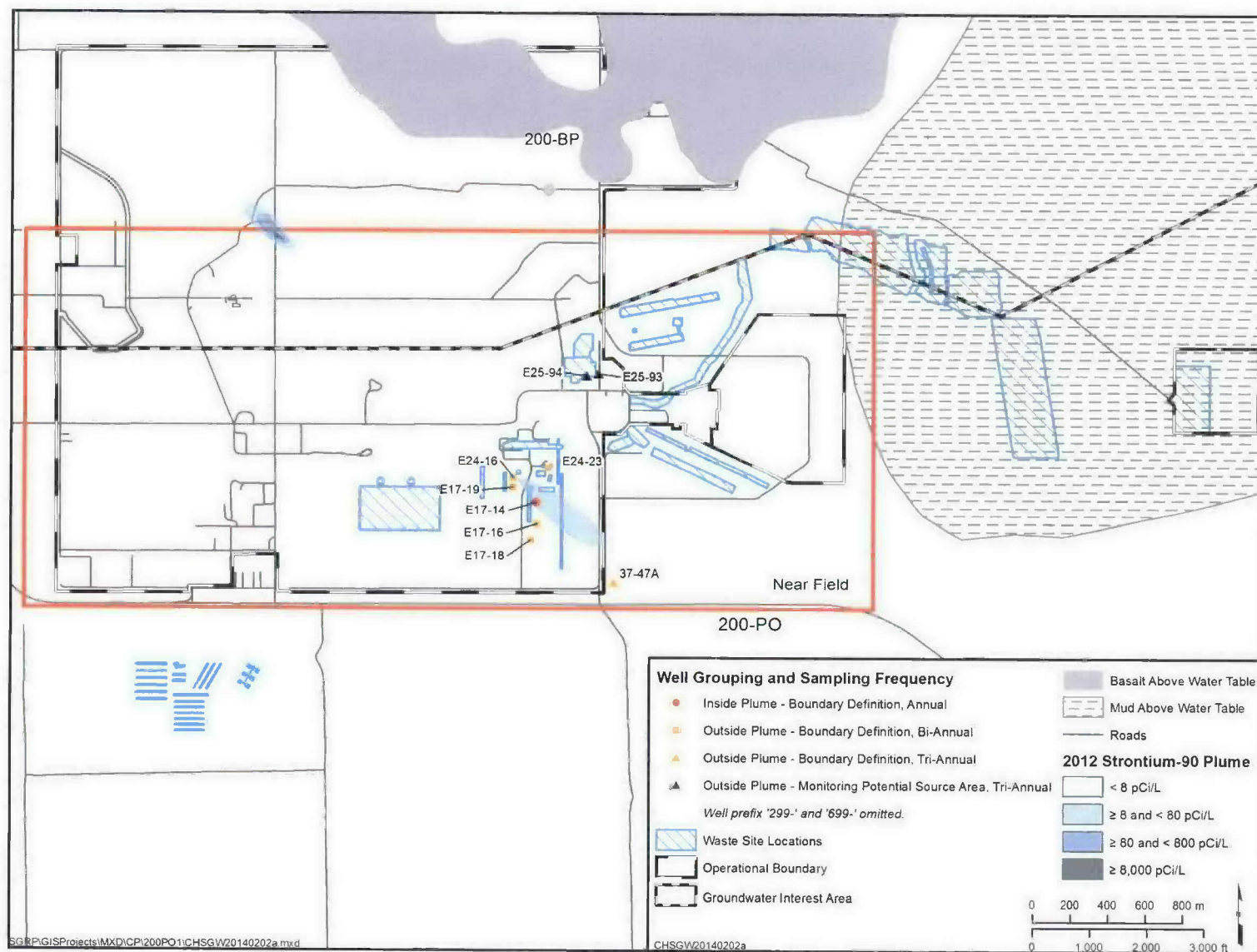


Figure 3-9. 200-PO-1 Well Network for Strontium-90 Plume Monitoring

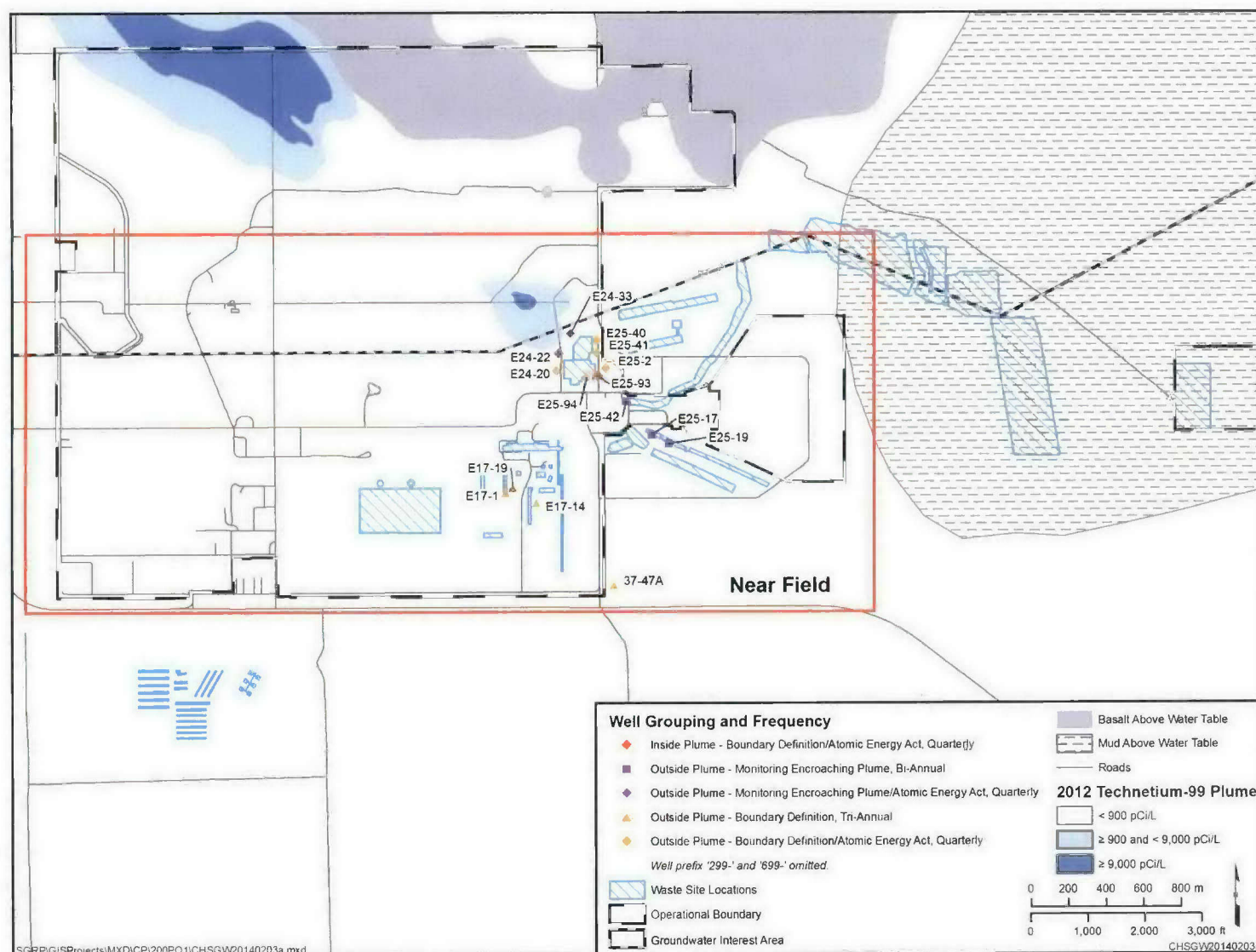


Figure 3-10. 200-PO-1 Well Network for Technetium-99 Plume Monitoring

3.2.1.3 Other Smaller Monitoring Well Networks

Three smaller well networks are present in the Far Field but are monitored under separate groundwater monitoring plans. These include NRDWL (a RCRA TSD), SWL (regulated by WAC 173-304, “Minimum Functional Standards for Solid Waste Handling”), and 200 Area TEDF (regulated by WAC 173-216, “State Waste Discharge Permit Program”). Some of the wells in these smaller networks are co-sampled with the 200-PO-1 Groundwater OU network, and the remainder provide supplementary data.

3.3 Sampling Methods

Sampling methods may include, but are not limited to, the following:

- Field screening measurements
- Radiological screening
- Groundwater sampling
- Water level measurements

Water samples will be collected according to the current revision of applicable operating methods. Water samples are collected after field measurements of purged groundwater have stabilized:

- pH – two consecutive measurements agree within 0.2 pH units
- Temperature – two consecutive measurements agree within 0.2°C
- Conductivity – two consecutive measurements agree within 10 percent of each other
- Turbidity – less than 5 nephelometric turbidity units prior to sampling (or project scientist’s recommendation)

For certain types of samples, preservatives are required. While the preservative may be added to the collection bottles before their use in the field, it is allowable to add the preservative at the sampling vehicle immediately after collection. Samples may require filtering in the field, as noted on the chain-of-custody forms.

To ensure sample and data usability, the sampling associated with this SAP will be performed according to HASQARD (DOE/RL-96-68) pertaining to sample collection, collection equipment, and sample handling.

Suggested sample container, preservation, and holding time requirements are specified in Table 2-6 for groundwater samples. These requirements are in accordance with the analytical method specified. The final container type and volumes will be identified on the SAF and chain-of-custody form. This SAP defines a “sample” as a filled sample bottle for starting the clock for holding time restrictions.

Holding time is the elapsed time period between sample collection and analysis. Exceeding required holding times could result in changes in constituent concentrations due to volatilization, decomposition, or other chemical alterations. Required holding times depend on the analytical method, as specified for appropriate EPA methods (EPA-600/4-79-020; SW-846).

3.3.1 Decontamination of Sampling Equipment

Sampling equipment will be decontaminated in accordance with the sampling equipment decontamination methods. To prevent potential contamination of the samples, care should be taken to use decontaminated equipment for each sampling activity.

Special care should be taken to avoid the following common ways in which cross-contamination or background contamination may compromise the samples:

- Improperly storing or transporting sampling equipment and sample containers
- Contaminating the equipment or sample bottles by setting the equipment/sample bottle on or near potential contamination sources (e.g., uncovered ground)
- Handling bottles or equipment with dirty hands or gloves
- Improperly decontaminating equipment before sampling or between sampling events

3.3.2 Radiological Field Data

Alpha and beta/gamma data collection in the field will be used as needed to support sampling and analysis efforts. Radiological screening will be performed by the RCT or other qualified personnel. The RCT will record field measurements, noting the depth of the sample and the instrument reading. Measurements will be relayed to the field geologist (for boreholes and wells) for daily inclusion in the field logbook or operational records, as applicable.

The following information will be distributed to personnel performing work in support of this SAP:

- Instructions to RCTs on the methods required to measure sample activity and media for gamma, alpha, and/or beta emissions, as appropriate.
- Information regarding the portable radiological field instrumentation including: a physical description of the instruments, radiation and energy response characteristics, calibration/maintenance and performance testing descriptions, and the application/operation of the instrument. These instruments are commonly used on the Hanford Site to obtain measurements of removable surface contamination measurements and direct measurements of the total surface contamination.
- Instructions regarding the minimum requirements for documenting radiological controls information in accordance with 10 CFR 835, "Occupational Radiation Protection."
- Instructions for managing the identification, creation, review, approval, storage, transfer, and retrieval of radiological information.
- The minimum standards and practices necessary for preparing, performing, and retaining radiological-related information.
- The requirements associated with preparing and transporting regulated material.
- Daily reports of radiological surveys and measurements collected during conduct of field investigation activities. Data will be cross-referenced between laboratory analytical data and radiation measurements to facilitate interpreting the investigation results.

3.3.3 Water Levels

Groundwater levels are measured annually across the Hanford Site to construct water table maps that are used to determine the direction and rate of groundwater flow in the unconfined aquifer (SGW-38815).

Water levels are also measured in wells that are screened in confined, or partially confined aquifers to help determine horizontal and vertical hydraulic gradients.

A measurement of depth to water is also recorded in each well prior to sampling, using calibrated depth measurement tapes. Two consecutive measurements are taken that agree within 6mm (0.02 ft), these are recorded along with the date, time, measuring tape number, and so forth. The depth to groundwater is subtracted from the elevation of a reference point (usually the top of casing) to obtain the water level elevation. Tops of casings are known elevation reference points because they have been surveyed to local reference data.

3.4 Documentation of Field Activities

Logbooks or data forms are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook and only authorized persons may make entries in logbooks. Logbook entries will be reviewed by the FWS, cognizant scientist/engineer, or other responsible manager; the review will be documented with a signature and date. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

Data forms may be used to collect field information; however, the information recorded on data forms must follow the same requirements as those for logbooks. The data forms must be referenced in the logbooks.

A summary of the following information will be recorded in logbooks:

- Purpose of activity
- Day, date, time, and weather conditions
- Names, titles, and organizations of personnel present
- Deviations from the QAPjP
- All site activities, including field tests
- Materials quality documentation (e.g., certifications)
- Details of samples collected (e.g., preparation, splits, DUPs, MS, and EBs)
- Location and types of samples
- Chain-of-custody details and variances relating to chain-of-custody
- Field measurements
- Field calibrations testing, inspections, maintenance and surveys, and equipment identification numbers, as applicable
- Equipment decontaminated, number of decontaminations, and variations to decontamination methods
- Equipment failures or breakdowns and descriptions of any corrective actions
- Telephone calls relating to field activities

3.4.1 Corrective Actions and Deviations for Sampling Activities

The OU Project Manager, FWS, appropriate BTR (or designee), and SMR personnel must document deviations from protocols, problems pertaining to sample collection, chain-of-custody forms, target analytes, contaminants, sample transport, or noncompliant monitoring. Examples of deviations include samples not collected because of field conditions, changes in sample locations because of physical obstructions, or additions of sample depth(s).

As appropriate, such deviations or problems will be documented in the field logbook or on nonconformance report forms in accordance with internal corrective action methods. The OU Project Manager, FWS, appropriate BTR (or designee), or SMR personnel, will be responsible for communicating field corrective action requirements and for ensuring immediate corrective actions are applied to field activities.

Changes in sample activities that require notification, approval, and documentation will be performed as specified in Table 2-2.

3.5 Calibration of Field Equipment

Construction management, the appropriate BTR, or the FWS is responsible for ensuring that field equipment is calibrated appropriately. Onsite environmental instruments are calibrated in accordance with the manufacturer's operating instructions, internal work requirements and processes, and/or field instructions that provide direction for equipment calibration or verification of accuracy by analytical methods. The results from all instrument calibration activities are recorded according to HASQARD (DOE/RL-96-68).

Field instrumentation, calibration, and QA checks will be performed as follows:

- Prior to initial use of a field analytical measurement system.
- At the frequency recommended by the manufacturer or methods, or as required by regulations.
- Upon failure to meet specified QC criteria.
- Calibration of radiological field instruments on the Hanford Site is performed by the Mission Support Alliance prime contractor, as specified by their calibration program.
- Daily calibration checks will be performed and documented for each instrument used to characterize areas under investigation. These checks will be made on standard materials sufficiently like the matrix under consideration for direct comparison of data. Analysis times will be sufficient to establish detection efficiency and resolution.
- Standards used for calibration will be traceable to nationally or internationally recognized standard agency source or measurement system, if available.

3.6 Sample Handling

Sample handling and transfer will be in accordance with established methods to preclude loss of identity, damage, deterioration, and loss of sample. Custody seals or custody tape will be used to verify that sample integrity has been maintained during sample transport. The custody seal will be inscribed with the sampler's initials and date.

A sampling and data tracking database is used to track the samples from the point of collection through the laboratory analysis process.

3.6.1 Containers

Pre-cleaned sample containers with certificates of analysis denoting compliance with EPA specifications (EPA 540/R-93/051, *Specifications and Guidance for Contaminant-Free Sample Containers*) for the intended analyses will be used for samples collected for chemical analysis. Container sizes may vary depending on laboratory-specific volumes/requirements for meeting analytical detection limits. The Radiological Engineering organization will measure both the contamination levels and dose rates associated with the filled sample containers. This information, along with other data, will be used to select proper packaging, marking, labeling, and shipping paperwork and to verify that the sample can be received by the analytical laboratory in accordance with the laboratory's radioactivity acceptance criteria. If the dose rate on the outside of a sample container or the curie content exceeds levels acceptable by an offsite laboratory, the FWS (in consultation with the SMR organization), can send smaller volumes to the laboratory. Container types and sample amounts/volumes are identified in Table 2-6.

3.6.2 Container Labeling

Each sample container will be labeled with the following information on firmly affixed, water-resistant labels:

- SAF
- HEIS number
- Sample collection date and time
- Analysis required
- Preservation method (if applicable)
- Chain-of-custody number
- Bottle type and size
- Laboratory performing the analyses
- Sample location

In addition, sample records must include the following information:

- Analysis required
- Source of sample
- Matrix (water)
- Field data (pH, temperature, turbidity, and conductivity)
- Radiological readings

The following information may be specified by the project: dissolved oxygen and redox potential.

3.6.3 Sample Custody

Sample custody will be maintained in accordance with existing protocols to ensure the maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure sample integrity is maintained. A chain-of-custody record will be initiated in the field at the time of sampling and will accompany each set of samples shipped to any laboratory.

Shipping requirements will determine how sample shipping containers are prepared for shipment. The analyses requested for each sample will be indicated on the accompanying chain-of-custody form. Each time the responsibility for the custody of the sample changes, the new and previous custodians will

sign the record and note the date and time. The sampler will make a copy of the signed record before sample shipment and will transmit the copy to the SMR organization within 48 hours of shipping.

The following information is required on a completed chain-of-custody form:

- Project name
- Signature of sampler
- Unique sample number
- Date and time of collection
- Matrix
- Preservatives
- Signatures of individual involved in sample transfer
- Requested analyses (or reference thereto)

Samplers should note any anomalies with the samples that would prevent batching. If anomalies are found, the samplers should inform SMR before adding any information regarding batching on the chain-of-custody form.

3.6.4 Sample Transportation

All packaging and transportation instructions will comply with applicable transportation regulations and DOE requirements. Regulations for classifying, describing, packaging, marking, labeling, and transporting hazardous materials, hazardous substances, and hazardous wastes are enforced by the U.S. Department of Transportation (DOT) as described in 49 CFR 171, “General Information, Regulations, and Definitions,” through 177, “Carriage by Public Highway.” Carrier-specific requirements defined in the International Air Transportation Association Dangerous Goods Regulations should also be considered when preparing sample shipments conveyed by air freight providers.

Samples containing hazardous constituents will be considered hazardous material in transportation and transported according to DOT 49 CFR, “Transportation,” requirements. If the sample material is known or can be identified, then it will be packaged, marked, labeled, and shipped according to the specific instructions for that material.

Materials are classified by DOT as radioactive when the isotope-specific activity concentration and the exempt consignment limits described in 49 CFR 173, “Transportation,” “Shippers—General Requirements for Shipments and Packagings,” are exceeded. Samples will be screened, or relevant historical data will be used, to determine whether these values are exceeded. When screening or historical data indicate samples are radioactive, they will be properly classified, described, packaged, marked, labeled, and transported according to DOT requirements.

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4 Management of Waste

Waste materials are generated during sample collection, processing, and subsampling activities.

Waste will be managed in accordance with DOE/RL-2004-18, *Waste Control Plan for the 200-PO-1*

Operable Unit. For waste designation purposes, the maximum concentration in 5 years of historical data from HEIS for the analytes and wells listed in Tables 3-3 and 3-4, as applicable, will comprise a complete analytical data set.

Offsite analytical laboratories are responsible for the disposal of unused sample quantities. Pursuant to 40 CFR 300.440, "Procedures for Planning and Implementing Off-Site Response Actions," approval from the DOE Remedial Project Manager is required before returning unused samples or waste from offsite laboratories.

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5 Health and Safety

The hazardous waste operations safety and health program was established to ensure the safety and health of workers involved in hazardous waste site activities. The program was developed to comply with the requirements of 29 CFR 1910.120, "Occupational Safety and Health Standards," "Hazardous Waste Operations and Emergency Response," and 10 CFR 835. The health and safety program defines the chemical, radiological, and physical hazards and specifies the controls and requirements for day-to-day work activities on the overall Hanford Site. Personal training, control of industrial safety and radiological hazards, PPE, site control, and general emergency response to spills, fire, accidents, injury, site visitors, and incident reporting are governed by the health and safety program.

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Appendix A

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Data Quality Objectives and Sampling Design

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Terms

AEA	<i>Atomic Energy Act of 1954</i>
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
COPC	contaminant of potential concern
DQO	data quality objective
DWS	drinking water standard
FFTF	Fast Flux Test Facility
IBD	Inside Plume-boundary definition
IDF	Integrated Disposal Facility
IMCG	Inside Plume-monitoring concentration gradients
IMCSC	Inside Plume-monitoring continuing source contribution
MCL	maximum contaminant level
MDL	method detection limit
NA	not available
NRDWL	Nonradioactive Dangerous Waste Landfill
OBD	Outside Plume-boundary definition
ONBA	Outside Plume-non-boundary area
OMEF	Outside Plume-monitoring encroaching plume
OMPSA	Outside Plume-monitoring potential source area
OU	operable unit
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RD/RAWP	remedial design/remedial action work plan
RI	remedial investigation
ROD	record of decision
SAP	sampling and analysis plan
SWL	Solid Waste Landfill
WAC	<i>Washington Administrative Code</i>
WMA	waste management area

2

A1 Introduction

The purpose of this data quality objective (DQO) process is to support the optimization of the routine groundwater monitoring network for the 200-PO-1 Groundwater Operable Unit (OU). Monitoring objectives are for the post-remedial investigation (RI) time period until a Record of Decision (ROD) has been obtained and the Remedial Design/Remedial Action Work Plan (RD/RAWP) is developed. The RI has been completed for this OU, and the results have been published in DOE/RL-2009-85, *Remedial Investigation Report for the 200-PO-1 Groundwater Operable Unit*.

Monitoring results will be used to provide current groundwater contamination information as the OU completes the RI/FS process, as well as support an annual groundwater plume assessment documented in the Annual Groundwater Report. In the post-ROD period, another DQO may be performed to support groundwater monitoring requirements documented in the ROD or associated RD/RAWP.

A1.1 Project Objectives

The objective of this DQO process is to define the methodology for determining an optimized routine groundwater monitoring network for the 200-PO-1 groundwater OU, considering that the OU is in the post-RI period. Well selection and the monitoring frequency should target two primary aspects of the contaminant distribution:

- Assessing spatial distribution of groundwater contaminants of potential concern (COPCs) in the unconfined aquifer
- Assessing the rate of plume migration or attenuation for COPCs in the unconfined aquifer

A1.2 Project Assumptions

In developing the DQOs for the sampling and analysis plan (SAP), the following assumptions were identified:

- Water-level monitoring for the 200-PO-1 groundwater OU is being addressed by SGW-38815, *Water-Level Monitoring Plan for the Hanford Site Soil and Groundwater Remediation Project*. Supplemental measurements are also performed as described in SGW-54165, *Evaluation of the Unconfined Aquifer Hydraulic Gradient Beneath the 200 East Area, Hanford Site*, utilizing a more accurate measurement methodology from selected wells to assist in determining local flow conditions in the 200 East Area. As a result, water level data collection needs are being addressed but not as part of the scope of this SAP.
- Basalt confined aquifer sampling is currently addressed in DOE/RL-2012-59, *Sampling and Analysis Plan for Groundwater Surveillance Monitoring on the Hanford Site*.
- In addition to *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) groundwater monitoring needs, the SAP should integrate with other groundwater monitoring programs (*Resource Conservation and Recovery Act of 1976* [RCRA] and *Atomic Energy Act of 1954* [AEA]) for an optimized sampling and analysis program. This is beyond the scope of this DQO; however, the SAP will address this integration need.
- Groundwater sampling and analysis plans need flexibility to adjust to spatial and temporal changes in contaminant distribution and hydraulic gradients. An annual review of groundwater monitoring data and revisions will be made as needed to the SAP.

A1.3 Pertinent References

The references used to develop this DQO can be found in Chapter 6 of the 200-PO-1 SAP. The key reference is the RI (DOE/RL-2009-85) performed for this OU.

A1.4 Background Information

Background information for the 200-PO-1 OU is detailed in the RI report (DOE/RL-2009-85) and the SAP, which contain information on the hydrogeology, groundwater flow, contaminant plumes, and sources of groundwater contamination.

A1.5 Contaminants of Potential Concern

The 200-PO-1 OU groundwater COPCs have been identified through the RI risk assessment process. Contaminants considered and excluded for the 200-PO-1 OU are presented in the RI report (DOE/RL-2009-85). The COPC list has been further refined as the result of a recent supplemental RI groundwater evaluation based on six years of data considered representative of current groundwater conditions (samples collected between January 2008 and December 2013). The current COPCs identified are shown in Table A1-1.

A1.6 Action Levels

The action levels for the proposed monitoring approach are the maximum contaminant level (MCL) drinking water standards (DWSs) (Table A1-1).

A1.7 Statement of the Problem

A groundwater monitoring program is needed to support the post-RI, pre-ROD phase of the CERCLA process. This program needs to support monitoring contamination in groundwater and provide information for use in the Annual Groundwater Report.

Table A1-1. 200-PO-1 Contaminants of Potential Concern

Contaminant	Chemical Abstracts Service Number	DWS (MCL) or WAC Cleanup Level	Quantitation Limit
Nitrate	14797-55-8	10,000 µg/L (as N)	250 µg/L (as N)
Iodine-129	15046-84-1	1 pCi/L	1 pCi/L
Strontium-90	10098-97-2	8 pCi/L	2 pCi/L
Technetium-99	14133-76-7	900 pCi/L	15 pCi/L
Tritium	10028-17-8	20,000 pCi/L	400 pCi/L
Uranium	7440-61-1	30 µg/L	0.02 µg/L

DWS = drinking water standard

MCL = maximum contaminant level

WAC = Washington Administrative Code

A2 Decision and Inputs

The following inputs and decisions have been identified as applicable to selection of the monitoring well network and sampling frequencies.

A2.1 Inputs

A2.1.1 Position of Monitoring Well with Respect to Contaminant Plume

- Inside Plume-Not Adjacent to Plume Boundary
- Inside Plume-Near Plume Boundary
- Outside Plume-Near Plume Boundary
- Outside Plume-Area Downgradient in Path of an Encroaching Plume
- Outside Plume-Nonboundary Area

Contaminant Concentration Trends at Each Well (Trending)

Concentration trends for COPCs at each well, along with historical plume behavior, are used to support the selection of monitoring frequencies. Use of concentration trending patterns in conjunction with sample frequency selection is discussed in Section A2.2.6 (Sample Frequency Selection Criteria).

Inside Plume

- Greater than the DWS
 - \neq DWS with increasing, decreasing, or variable concentrations
 - \neq DWS with stable concentrations trending

Outside Plume

- Less than the DWS
 - $<$ DWS with stable, variable, or decreasing concentration trending
 - $<$ DWS with increasing concentration trending

A2.2 Decisions

The following section identifies the decision rules (criteria) for well selection and sampling frequencies:

A2.2.1 Primary Well Selection Criteria

- Supports analysis of changes in plume boundary conditions
- Supports definition of concentration gradients within plume
- Supports analysis of impact to groundwater from contaminant source(s)

A2.2.2 Well Selection Options

- If more than one well is available in an area meeting the same criteria, selection of the well(s) may include use of professional judgment

For selection of wells outside of plume, utilization is primarily dependent on proximity of the well to the plume boundary

A2.2.3 Monitoring Frequencies

- Annual (supports analysis of dynamic plume conditions)
- Biennially (applicable for monitoring portions of plumes displaying gradual changes)
- Triennially (applicable for monitoring portions of low mobility plumes)
- None (appropriate for use if well is not needed for plume definition)

A2.2.4 Waste Sites Requiring Specific Monitoring Frequencies

- Identification of those waste sites with tailored monitoring requirements.
- AEA quarterly radionuclide monitoring requirements apply to waste management area (WMA) A/AX. AEA radionuclide monitoring requirements for WMA A/AX are provided in PNNL-15315, *RCRA Assessment Plan for Single-Shell Tank Waste Management Area A-AX at the Hanford Site*.

A2.2.5 Additional Conditions

Other regulatory or technical requirements relevant to well selection and monitoring frequency.

A2.2.6 Sampling Frequency Selection Criteria

Annual (A) Sampling—Appropriate for monitoring areas within the plume and along boundaries of the plume that historically have displayed dynamic changes in concentrations (increasing, decreasing or variable trends). For those wells inside and outside the plume that are along the margin of the plume, this sampling frequency supports definition of changing plume boundaries (i.e., DWS isolines). Outside the plume, this frequency may be appropriate for monitoring locations in the path of encroaching plumes displaying increasing concentration trends. Annual monitoring is the most common monitoring frequency applied for monitoring of dynamic plume conditions.

Biennial (BA) Sampling—Biennial sampling of wells is appropriate for use in areas both inside and outside the plume along plume boundaries showing low levels and slow changes in concentration (increasing, decreasing, stable, or variable concentration trending). Applicable for lower concentration areas in the path of an encroaching plume. Also appropriate to use for those contaminants that are relatively immobile showing only minor plume geometry changes from one year to the next (e.g., strontium-90 and iodine-129). Analyses showing sharply increasing concentrations for previous measurements would initiate a change from biennial sampling to a shorter frequency (i.e., annual).

Triennial (T) Sampling—Appropriate for monitoring portions of the interior of contaminant plumes with a relatively high density of well coverage and along plume boundaries showing very slow migration characteristics and relatively stable concentration trending. Applicable for use with contaminants displaying low mobility, resulting in minor plume geometry changes from one year to the next (e.g., strontium-90 and iodine-129). Most applicable to plume definition in the Far Field portion of the tritium and iodine-129 plumes. Triennial sampling applied within a select group of wells on a rotating basis is appropriate for providing coverage in some monitoring areas. Analyses showing sharply increasing concentrations for previous measurements would initiate a change from triennial sampling to a shorter frequency (e.g., biennial or annual).

None—Appropriate in areas outside the plume where wells are not needed to define the plume boundary or concentration changes. COPC concentrations trending for wells in these areas may be stable, variable, increasing, or decreasing, but should be consistently less than DWS. Also applicable in areas where more than one well is present that meets a well selection criteria and all the wells have similar concentrations/activities with similar trends over time.

Well Grouping Categories:

The following well grouping categories are used in the 200-PO-1 well selection and frequency determination process. Correlation of the well groupings with applicable frequency criteria are provided in Table A2-1.

1. Inside Plume-monitoring continuing source contribution (IMCSC)
2. Inside Plume-monitoring concentration gradients (IMCG)
3. Inside Plume-boundary definition (IBD)
4. Outside Plume-boundary definition (OBD)
5. Outside Plume-monitoring encroaching plume (OMEPE)
6. Outside Plume-non-boundary area (ONBA)
7. Outside Plume-monitoring potential source area (OMPSA)

**Table A2-1. Well Sampling Frequency Determination Criteria For Monitoring Contaminant Plumes
(Based on 7-Year Data Analysis from 2007 to 2013)**

Well Location	Well Grouping Categories	Sampling Frequencies	Comments
Inside Plume	Inside Plume-monitoring continuing source contribution (IMCSC)	A, BA, or None	<p>If well is beneath or immediately downgradient of a known source of groundwater degradation and consistently shows increasing concentrations above DWS, then A frequency is appropriate.</p> <p>BA frequency is appropriate for use in areas where contaminants are relatively immobile, resulting in minor plume geometry changes from one year to the next (e.g., strontium-90 and iodine-129).</p> <p>None is appropriate for instances where multiple wells are present in an area and the wells have similar concentrations/activities with similar trends over time. Those wells with the lowest concentration/activity and have the shortest water column in the screen interval would be candidates for no monitoring.</p>
	Inside Plume-monitoring concentration gradients (IMCG)	A, BA, T, or None	<p>A is preferred for the highest concentration area of the plume.</p> <p>BA is appropriate for use in areas where contaminants are relatively immobile, resulting in minor plume geometry changes from one year to the next (e.g., strontium-90 and iodine-129).</p> <p>T is appropriate for use in areas with a relatively high density of well coverage.</p> <p>T is generally applicable for the Far Field</p>

**Table A2-1. Well Sampling Frequency Determination Criteria For Monitoring Contaminant Plumes
(Based on 7-Year Data Analysis from 2007 to 2013)**

Well Location	Well Grouping Categories	Sampling Frequencies	Comments
			portions of the tritium and iodine-129 plumes. None is appropriate if more than one well is present in the area and the wells have similar concentrations/activities with similar trends over time. For multiple wells in the same area, no monitoring is appropriate for those wells not needed to define concentration gradients inside the plume.
	Inside Plume-boundary definition (IBD)	A, BA, or None	A is preferred if the plume boundary is dynamic as indicated by trending and historical plume behavior. This sampling frequency supports definition of migrating plume boundaries. BA is appropriate for use with wells where concentration trending is stable and/or contaminants are relatively immobile, resulting in minor plume geometry changes from one year to the next (e.g., strontium-90 and iodine-129). None is appropriate if more than one well is present in a plume boundary area and the wells have similar concentrations/activities with similar trends over time. For multiple wells in the same area, no monitoring is appropriate for those wells not needed to define the plume geometry.
Outside Plume	Outside Plume-boundary definition (OBD)	A, BA, T, or None	A is preferred if the plume boundary is dynamic and expanding as indicated by trending and historical plume behavior. This sampling frequency supports definition of migrating plume boundaries. If highest concentration is less than 1/2 DWS, then BA frequency is appropriate. T is generally most applicable to the Far Field portions of the tritium and iodine-129 plumes. None is appropriate if more than one well is present in a plume boundary area and the wells have similar concentrations/activities with similar trends over time. For multiple wells in the same area, no monitoring is appropriate for

**Table A2-1. Well Sampling Frequency Determination Criteria For Monitoring Contaminant Plumes
(Based on 7-Year Data Analysis from 2007 to 2013)**

Well Location	Well Grouping Categories	Sampling Frequencies	Comments
			those wells not needed to define the plume geometry.
	Outside Plume-monitoring encroaching plume (OMEP)	A or BA	A is preferred when wells display sharply increasing trending. If highest concentration with increasing trend is less than 1/2 DWS, then BA frequency is appropriate.
	Outside Plume-non-boundary area (ONBA)	None	Concentrations stable, variable, increasing, or decreasing and consistently less than DWS. Other wells in area can be used to define plume boundary or an encroaching plume.
	Outside Plume-monitoring of potential source area (OMPSA)	A or T	If well is beneath or immediately downgradient of potential source of groundwater degradation that has previously shown concentrations above DWS, an A frequency is appropriate. If well is beneath or immediately downgradient of potential source of groundwater degradation that has not previously shown concentration above DWS, T frequency is appropriate.

A3 Sample Design

Application of the well selection and frequency criteria for the contaminants identified in Table A1-1 was completed well by well for the entire 200-PO-1 well network using analytical data for the period from 2007 through 2013. If data were available for 2014 those data were utilized. Results of the analysis are provided in Tables A3-1 through A3-6. The resulting wells and sampling frequencies identified for use in monitoring each of the COPCs, based on this analysis, are provided in Chapter 3 of the SAP.

A4 References

- 1
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22 Available at: <http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0085682>.

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration mg/L (45 mg/L = DWS)	Min Concentration mg/L (45 mg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E13-11	Far Field	BC_Cribs	ONBA	2008, 2009, 2011, 2012, 2013	6	6	8.8	6.6	D	None
299-E13-14	Far Field	BC_Cribs	ONBA	2007, 2008, 2010, 2011, 2012, 2013	7	7	15.9	10	V	None
299-E13-19	Far Field	BC_Cribs	ONBA	2008-2013	6	6	9.3	8.1	I	None
299-E13-5	Far Field	BC_Cribs	ONBA	2007-2013	7	7	10.7	9.3	V	None
299-E16-2	Near Field		OBD	2007-2013	7	7	8.8	2.7	I	BA
299-E17-1	Near Field		IMCG	2007, 2008, 2009, 2010, 2012, 2013	12	12	90.3	55.3	D	A
299-E17-12	Near Field		IBD	2007-2013	7	7	54.4	36.4	I	A
299-E17-13	Near Field		IMCG	2007-2013	7	7	59.3	35.8	I	T
299-E17-14	Near Field	216-A-36B	IMCG	2007-2013	25	25	154	93.4	V	A
299-E17-16	Near Field	216-A-36B	IMCG	2007-2013	12	12	65.1	48.7	V	T
299-E17-18	Near Field	216-A-36B	IBD	2007-2013	12	12	55.3	38.5	I	A
299-E17-19	Near Field	216-A-36B	IMCG	2007-2013	15	15	172	88.1	I	A
299-E17-21	Near Field		OMEP	2008, 2011, 2012	3	3	31	25.8	I	A
299-E17-22	Near Field	IDF	IBD	2007-2013	26	26	59.8	37.2	I	A
299-E17-23	Near Field	IDF	OMEP	2007-2013	25	25	37.6	19.5	I	A

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

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299-E17-25	Near Field	IDF	OMEP	2007-2013	24	24	49.6	19	I	A
299-E17-26	Near Field	IDF	OMEP	2007-2013	21	20	46	27.4	I	A
299-E18-1	Near Field	IDF	OBD	2007-2013	27	27	14.7	12	V	BA
299-E23-1	Near Field		IBD	2007, 2008, 2009, 2012	6	6	58	42.5	I	A
299-E24-16	Near Field		IMCG	2007-2013	21	21	78.4	53.6	V	T
299-E24-18	Near Field		IMCG	2007-2013	11	11	65.1	45.2	V	T
299-E24-20	Near Field	WMA_A_AX	OBD	2007-2013	29	29	57.5	26.8	I	A
299-E24-21	Near Field	IDF	IBD	2007-2013	21	21	47.4	42.9	S	BA
299-E24-22	Near Field	WMA_A_AX	OBD	2007-2013	32	32	26.3	10.2	I	A
299-E24-23	Near Field		IBD	2007, 2008, 2009, 2012, 2013	7	7	85.9	49.1	V	A
299-E24-24	Near Field	IDF	IBD	2007-2013	21	21	69.9	52.2	D	BA
299-E24-33	Near Field	WMA_A_AX	OBD	2007-2013	30	30	36.3	14.2	I	A
299-E24-5	Near Field		OBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	17.8	6.5	I	BA
299-E25-17	Near Field	216-A-37-1	OMEP	2007-2013	12	12	25.9	10.6	I	A
299-E25-18	Near Field		OBD	2007-2013	7	7	23.4	6.2	I	A
299-E25-19	Near Field	216-A-37-1	OBD	2007-2013	21	21	70.8	27.9	V	A

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration mg/L (45 mg/L = DWS)	Min Concentration mg/L (45 mg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E25-2	Near Field	WMA_A_AX	OBD	2007-2013	29	29	30.9	15.5	I	A
299-E25-20	Near Field	216-A-37-1	IBD	2007-2013	10	10	62.4	41.1	I	A
299-E25-22	Near Field		OBD	2007-2013	7	7	20.9	7.1	I	BA
299-E25-26	Near Field	216-A-29	ONBA	2007, 2008, 2009, 2013	7	7	7.9	2.8	I	None
299-E25-28	Near Field	216-A-29	ONBA	2007-2013	14	14	6.9	1.5	I	None
299-E25-29P	Near Field		IBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	118	54.4	V	A
299-E25-29Q	Near Field		IBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	34.4	23	V	A
299-E25-3	Near Field		OMEP	2007, 2008, 2009, 2010, 2012, 2013	6	6	39.3	32.7	S	BA
299-E25-32P	Near Field	216-A-29	OMEP	2007-2013	14	14	19.7	3.3	I	BA
299-E25-32Q	Near Field		OMEP	2007, 2009, 2010, 2011, 2012, 2013	6	6	15.7	3.5	I	BA
299-E25-34	Near Field	216-A-29	ONBA	2007-2013	11	11	1.7	1.3	I	None
299-E25-35	Near Field	216-A-29	ONBA	2007-2013	15	15	6.7	5.3	V	None
299-E25-36	Near Field		OBD	2007-2013	7	7	48.7	22.3	D	A

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration mg/L (45 mg/L = DWS)	Min Concentration mg/L (45 mg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E25-37	Near Field		ONBA	2007, 2009, 2010, 2011, 2012, 2013	6	6	1.3	1.1	V	None
299-E25-39	Near Field		ONBA	2008	1	1	7.8	7.8	NA	None
299-E25-40	Near Field	WMA_A_AX	OBD	2007-2013	33	33	13	4.1	I	BA
299-E25-41	Near Field	WMA_A_AX	OBD	2007-2013	29	29	39.6	23.9	I	A
299-E25-42	Near Field		OBD	2007-2013	7	6	17.4	15.6	I	BA
299-E25-43	Near Field		ONBA	2007, 2009, 2010, 2011, 2012, 2013	6	6	12.9	5.3	I	None
299-E25-44	Near Field		OBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	10.5	2.9	I	BA
299-E25-47	Near Field	216-A-37-1	OMEP	2007, 2009, 2010, 2011, 2012, 2013	12	12	38.6	14.2	I	A
299-E25-48	Near Field	216-A-29	OMEP	2007-2013	15	15	44.3	29.2	I	A
299-E25-6	Near Field		ONBA	2007-2013	7	7	4.5	2.2	I	None
299-E25-93	Near Field	WMA_A_AX	IBD	2007-2013	29	29	62	41.5	D	A
299-E25-94	Near Field	WMA_A_AX	OBD	2007-2013	29	29	38.6	23.4	V	A
299-E26-4	Near Field		ONBA	2007, 2008, 2009, 2010, 2012, 2013	6	6	15.3	9.7	I	None

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration mg/L (45 mg/L = DWS)	Min Concentration mg/L (45 mg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E26-12	Near Field	216-A-29	ONBA	2007-2013	10	10	6.6	3.5	I	None
299-E26-13	Near Field	216-A-29	ONBA	2007-2013	16	16	12.4	7.1	I	None
499-S0-7	Far Field	FFTF	ONBA	2007, 2008, 2009, 2010, 2012	9	9	6	0.5	V	None
499-S0-8	Far Field	FFTF	ONBA	2007, 2008, 2009, 2010, 2012	8	8	16.6	0.2	V	None
499-S1-8J	Far Field	FFTF	ONBA	2007, 2008, 2009, 2010, 2012	9	4	0.7	0.04	I	None
699-10-54A	Far Field		ONBA	2007-2013	11	10	21.7	19.9	S	None
699-10-E12	Far Field		ONBA	2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014	10	10	34.1	24.9	D	None
699-14-38	Far Field		ONBA	2007, 2010, 2013	6	6	18.9	16.8	I	None
699-17-5	Far Field		ONBA	2010, 2013	4	4	36.7	31.3	V	None
699-19-43	Far Field		ONBA	2007, 2010, 2013	3	3	11.1	9.78	D	None
699-20-20	Far Field		OBD	2007, 2010, 2013	5	5	41.6	34	D	T

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration mg/L (45 mg/L = DWS)	Min Concentration mg/L (45 mg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-20-E120	Far Field		ONBA	2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014	9	8	10.8	2.4	V	None
699-20-E12S	Far Field		ONBA	2007, 2010, 2013	3	3	0.491	0.293	D	None
699-20-E5A	Far Field		ONBA	2007, 2010, 2013	7	7	41.6	34.3	D	None
699-21-6	Far Field		ONBA	2007, 2010, 2013	3	3	36.4	15.1	I	None
699-22-35	Far Field	SWL	ONBA	2007-2013	29	29	19	17.3	S	None
699-2-3	Far Field		ONBA	2007, 2010, 2012	3	3	31.2	30	V	None
699-24-46	Far Field		ONBA	2007, 2008, 2009, 2012, 2013	6	6	6.64	5	S	None
699-26-15A	Far Field		ONBA	2007, 2010, 2013	5	5	33.6	27.2	I	None
699-26-33	Far Field	NRDWL	ONBA	2007-2013	16	16	20.4	18.9	V	None
699-26-35A	Far Field	NRDWL/SWL	ONBA	2007-2013	29	29	19.5	16.4	I	None
699-2-6A	Far Field		ONBA	2007-2013	7	7	28.2	20.8	I	None
699-2-7	Far Field		ONBA	2007-2013	7	7	52.7	28.9	D	None

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration mg/L (45 mg/L = DWS)	Min Concentration mg/L (45 mg/L = DWS)	Concentration Trending (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-28-40	Far Field		ONBA	2007, 2010, 2012	3	3	3.5	1.15	I	None
699-29-4	Far Field		ONBA	2007, 2010, 2013	5	5	41.6	30.4	D	None
699-31-11	Far Field		ONBA	2007, 2010, 2013	5	5	37.2	24.6	D	None
699-31-31	Far Field		ONBA	2007, 2008, 2009, 2010, 2011	6	6	1.55	0.629	V	None
699-32-22A	Far Field		ONBA	2007-2013	13	13	21.4	18.1	I	None
699-32-43	Far Field		ONBA	2007-2013	9	9	21.7	18.4	V	None
699-33-56	Far Field		ONBA	2007, 2008, 2010, 2013	4	4	15.3	14.5	V	None
699-34-41B	Far Field		ONBA	2007, 2010, 2013	3	3	31.4	27.3	D	None
699-34-42	Far Field		ONBA	2007, 2011, 2013	3	3	31.2	24.8	I	None
699-35-9	Far Field		OBD	2007, 2010, 2013	5	5	41.7	33.7	D	T
699-37-43	Near Field		ONBA	2007, 2010, 2013	3	3	9.2	5.09	D	None
699-37-47A	Near Field		OMEP	2007-2013	10	10	34.7	22.1	I	A

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration mg/L (45 mg/L = DWS)	Min Concentration mg/L (45 mg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-37-E4	Far Field		ONBA	2007, 2010, 2013	3	3	36.1	33.6	D	None
699-38-15	Far Field		ONBA	2007, 2010, 2013	5	5	23.3	21.4	D	None
699-39-39	Far Field	Ringold Confined	IMCG	2007, 2009, 2010, 2012, 2013	5	5	94.7	86.3	S	BA
699-40-1	Far Field		ONBA	2007, 2010, 2013	3	3	30.6	28.9	V	None
699-40-33A	Far Field		ONBA	2007, 2010, 2013	3	3	7.88	3.45	I	None
699-40-36	Far Field	Ringold Confined	ONBA	2007-2012	24	18	0.208	0.066	S	None
699-41-1A	Far Field		ONBA	2007-2013	10	10	31.9	29.4	S	None
699-41-23	Far Field		ONBA	2007-2013	10	10	7.5	5.18	I	None
699-41-40	Far Field	Ringold Confined	ONBA	2007, 2010, 2013	5	5	11.1	9.65	D	None
699-41-42	Far Field		ONBA	2007, 2009, 2010, 2011, 2012, 2013	6	6	9.87	9.16	S	None
699-42-12A	Far Field		ONBA	2007, 2010, 2013	5	5	18	15.7	D	None
699-42-39A	Far Field		ONBA	2007, 2010, 2013	3	3	8.19	8.01	S	None

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration mg/L (45 mg/L = DWS)	Min Concentration mg/L (45 mg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-42-39B	Far Field	Ringold Confined	ONBA	2007, 2010, 2013	3	3	7.3	6.33	I	None
699-42-42B	Far Field	216-B-3/Ringold Confined	ONBA	2007, 2008, 2009, 2010, 2011, 2012, 2013	13	13	8.41	6.82	V	None
699-43-3	Far Field		ONBA	2007, 2010, 2013	3	3	32.8	31.2	S	None
699-43-44	Near Field	B Pond	ONBA	2007-2013	8	8	3.8	3.1	S	None
699-43-45	Near Field	216-A-29/216-B-3	ONBA	2007-2013	18	18	8.28	1.73	U	None
699-46-21B	Far Field		ONBA	2007-2013	10	10	27.9	21	D	None
699-46-4	Far Field		ONBA	2007-2013	9	9	27.9	10.1	D	None
699-47-5	Far Field		ONBA	2007, 2010, 2013	3	3	15.3	14.1	S	None
699-48-7A	Far Field		ONBA	2007, 2010, 2013	3	3	1.75	1.23	S	None
699-49-13E	Far Field		ONBA	2007, 2013	3	3	9.52	8.72	I	None
699-52-19	Far Field		ONBA	2007, 2010	2	2	5.8	5.8	S	None
699-8-17	Far Field		ONBA	2007, 2009, 2012	3	3	29.8	26.6	I	None
699-8-25	Far Field		ONBA	2007, 2010, 2013	5	5	19.5	15.1	D	None
699-9-E2	Far Field		ONBA	2007, 2012,	3	3	7.97	4.25	D	None

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration mg/L (45 mg/L = DWS)	Min Concentration mg/L (45 mg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
				2013						
699-S12-3	Far Field		ONBA	2007	1	1	12.1	12.1	NA	None
699-S19-E13	Far Field		ONBA	2007, 2008, 2009, 2010, 2012, 2014	8	8	27.7	21.3	V	None
699-S19-E14	Far Field		ONBA	2007, 2010, 2013	3	3	32.3	27.5	D	None
699-S3-25	Far Field		ONBA	2007, 2010, 2013	6	6	2.72	1.84	I	None
699-S3-E12	Far Field		ONBA	2007-2013	10	9	1.81	0.227	D	None
699-S6-E14A	Far Field		ONBA	2007, 2009, 2010	3	3	7.3	4.65	I	None
699-S8-19	Far Field		ONBA	2007, 2008, 2010, 2013	6	6	31	24.9	V	None

Table A3-1. Well Network Analysis and Sampling Frequency Determination for Nitrate Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration mg/L (45 mg/L = DWS)	Min Concentration mg/L (45 mg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
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Note: Maximum values exceeding the DWS are bolded.

DWS = Drinking Water Standard
 FFTF = Fast Flux Test Facility
 IMCG = Inside Plume-monitoring concentration gradients
 IBD = Inside Plume-boundary definition
 IDF = Integrated Disposal Facility
 MDL = Method Detection Limit
 NRDWL = Nonradioactive Dangerous Waste Landfill
 OBD = Outside Plume-boundary definition
 OMEP = Outside Plume-monitoring encroaching plume
 ONBA = Outside Plume-non-boundary area
 OMPSA = Outside Plume-monitoring potential source area
 RCRA = Resource Conservation and Recovery Act of 1976
 SWL = Solid Waste Landfill
 WMA = Waste Management Area

Table A3-2. Well Network Analysis and Sampling Frequency Determination for Iodine-129 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (1 pCi/L = DWS)	Min Concentration pCi/L (1 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E13-11	Far Field	BC_Cribs	ONBA	2008	1	0	non-detect	non-detect	NA	None
299-E13-14	Far Field	BC_Cribs	ONBA	2008	1	0	non-detect	non-detect	NA	None
299-E13-19	Far Field	BC_Cribs	ONBA	2008	1	0	non-detect	non-detect	NA	None
299-E13-5	Far Field	BC_Cribs	ONBA	2008	1	0	non-detect	non-detect	NA	None
299-E16-2	Near Field		OBD	2007-2013	8	6	2.29	0.389	V	A
299-E17-1	Near Field		IBD	2008, 2009, 2010, 2012, 2013	6	4	7.43	3.78	V	A
299-E17-12	Near Field		ONBA	2007-2013	7	5	1.1	0.486	D	None
299-E17-13	Near Field		OBD	2007-2013	7	5	1.01	0.378	D	BA
299-E17-14	Near Field	216-A-36B	IMCG	2007-2013	11	11	10.4	3.1	V	A
299-E17-16	Near Field	216-A-36B	IBD	2007-2013	7	5	3.55	1.28	V	A
299-E17-18	Near Field	216-A-36B	OBD	2007-2013	7	6	3.5	0.466	D	BA
299-E17-19	Near Field	216-A-36B	IMCG	2007-2013	8	8	10.2	5.9	V	T
299-E17-21	Near Field		ONBA	2008, 2011, 2012	3	0	non-detect	non-detect	S	None
299-E17-22	Near Field	IDF	OBD	2007-2013	14	7	1.08	0.532	S	BA

Table A3-2. Well Network Analysis and Sampling Frequency Determination for Iodine-129 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (1 pCi/L = DWS)	Min Concentration pCi/L (1 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E17-23	Near Field	IDF	ONBA	2007-2013	13	1	0.423	0.423	S	None
299-E17-25	Near Field	IDF	ONBA	2007-2013	11	2	0.539	0.516	I	None
299-E17-26	Near Field	IDF	ONBA	2008, 2009, 2010, 2011, 2012, 2013	8	4	0.389	0.23	S	None
299-E18-1	Near Field	IDF	ONBA	2007-2013	12	0	non-detect	non-detect	S	None
299-E23-1	Near Field		OBD	2007, 2008, 2009, 2012	5	0	non-detect	non-detect	S	BA
299-E24-16	Near Field		IMCG	2008, 2009, 2010, 2011, 2012, 2013	6	4	11.4	3.41	V	A
299-E24-18	Near Field		OBD	2007-2013	8	5	0.932	0.487	D	BA
299-E24-20	Near Field	WMA_A_AX	IMCG	2007, 2008, 2010, 2011, 2012, 2013	8	7	5.63	3.04	S	T
299-E24-21	Near Field	IDF	OBD	2008, 2009, 2010, 2011, 2012, 2013	8	5	0.726	0.464	S	BA
299-E24-22	Near Field	WMA_A_AX	IMCG	2008, 2009, 2010, 2011, 2012, 2013	10	8	6.73	2.27	V	A
299-E24-23	Near Field		IMCG	2007, 2008, 2009, 2012, 2013	6	5	6.81	2.92	V	T
299-E24-24	Near Field	IDF	ONBA	2008, 2009, 2010, 2011, 2012, 2013	8	3	0.487	0.265	D	None
299-E24-33	Near	WMA_A_AX	IMCG	2008, 2009, 2011	7	5	6.49	2.64	V	A

Table A3-2. Well Network Analysis and Sampling Frequency Determination for Iodine-129 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (1 pCi/L = DWS)	Min Concentration pCi/L (1 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
	Field			2012 2013						
299-E24-5	Near Field		IBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	4.8	2.64	S	BA
299-E25-17	Near Field	216-A-37-1	IMCG	2007-2013	8	8	4.01	2.01	D	T
299-E25-18	Near Field		IMCG	2007-2013	7	6	4.82	3.13	I	A
299-E25-19	Near Field	216-A-37-1	IMCG	2007-2013	8	8	2.48	1.25	D	T
299-E25-2	Near Field	WMA_A_AX	IMCG	2008, 2009, 2011, 2012, 2013	7	5	5.12	2.36	D	BA
299-E25-20	Near Field	216-A-37-1	IMCG	2007-2013	10	9	2.66	1.24	V	T
299-E25-22	Near Field		IBD	2007- 2013	8	7	2.51	1.82	S	BA
299-E25-26	Near Field	216-A-29	IMCG	None	0	0	None	None	None	T
299-E25-28	Near Field	216-A-29	IMCG	2007-2013	7	5	4.83	1.91	V	A
299-E25-29P	Near Field		IMCG	2007, 2009, 2010, 2011, 2012, 2013	6	4	3.16	1.49	V	A
299-E25-29Q	Near Field		IMCG	2007, 2009, 2010, 2011, 2012, 2013	6	4	2.77	1.14	V	A
299-E25-3	Near Field		IMCG	2007, 2008, 2009, 2010, 2012, 2013	6	6	5.18	2.55	I	BA

Table A3-2. Well Network Analysis and Sampling Frequency Determination for Iodine-129 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (1 pCi/L = DWS)	Min Concentration pCi/L (1 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E25-32P	Near Field	216-A-29	IBD	2007, 2009, 2010, 2011, 2012, 2013	6	5	6.28	1.44	V	A
299-E25-32Q	Near Field		IBD	2007, 2009, 2010, 2011, 2012, 2013	6	3	5.51	4.58	V	A
299-E25-34	Near Field	216-A-29	IMCG	2007, 2009, 2010, 2011, 2012, 2013	6	5	5.18	2.73	I	A
299-E25-35	Near Field	216-A-29	IMCG	2007, 2009, 2010, 2011, 2012, 2013	7	6	5.11	4.32	V	T
299-E25-36	Near Field		IBD	2007-2013	7	7	6.07	2.04	D	A
299-E25-37	Near Field		IMCG	2007, 2009, 2010, 2011, 2012, 2013	6	6	3.05	1.32	V	T
299-E25-39	Near Field		IBD	2008	1	0	non-detect	non-detect	S	BA
299-E25-40	Near Field	WMA_A_AX	IMCG	2008, 2010, 2011, 2012, 2013	8	8	7.56	2.78	V	A
299-E25-41	Near Field	WMA_A_AX	IMCG	2007, 2008, 2010, 2011, 2012, 2013	8	8	6.52	4.87	S	BA
299-E25-42	Near Field		IMCG	2007-2013	7	7	8.2	3.37	V	A
299-E25-43	Near Field		IMCG	2007, 2009, 2010, 2011, 2012, 2013	6	5	8.01	5.18	V	T
299-E25-44	Near Field		IBD	2007, 2009, 2010, 2011, 2012, 2013	6	5	1.84	1.25	S	BA
299-E25-47	Near	216-A-37-1	IMCG	2007, 2009, 2010,	6	6	5.36	2.56	V	T

Table A3-2. Well Network Analysis and Sampling Frequency Determination for Iodine-129 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (1 pCi/L = DWS)	Min Concentration pCi/L (1 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
	Field			2011, 2012, 2013						
299-E25-48	Near Field	216-A-29	IMCG	no data	no data	no data	no data	no data	NA	T
299-E25-6	Near Field		IMCG	2007-2013	7	7	6.99	3.23	V	T
299-E25-93	Near Field	WMA_A_AX	IMCG	2008, 2009, 2010, 2011, 2012, 2013	6	5	6.5	1.31	D	A
299-E25-94	Near Field	WMA_A_AX	IMCG	2009, 2010, 2011, 2012, 2013	6	6	8.07	4.35	D	A
299-E26-4	Near Field		IMCG	2007, 2008, 2009, 2010, 2012, 2013	6	6	6.76	3.83	V	T
299-E26-12	Near Field	216-A-29	IMCG	no data	no data	no data	no data	no data	NA	T
299-E26-13	Near Field	216-A-29	IMCG	no data	no data	no data	no data	no data	NA	T
499-S0-7	Far Field	FFTF	ONBA	2007, 2008, 2009, 2010, 2012	9	0	non-detect	non-detect	S	None
499-S0-8	Far Field	FFTF	ONBA	2007, 2008, 2009, 2010, 2012	8	0	non-detect	non-detect	S	None
499-S1-8J	Far Field	FFTF	ONBA	2007, 2008, 2009, 2010, 2012	9	0	non-detect	non-detect	S	None
699-10-54A	Far Field		ONBA	2008, 2010	4	0	non-detect	non-detect	S	None
699-10-E12	Far Field		ONBA	2008, 2011	2	0	non-detect	non-detect	S	None
699-14-38	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None

Table A3-2. Well Network Analysis and Sampling Frequency Determination for Iodine-129 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (1 pCi/L = DWS)	Min Concentration pCi/L (1 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-17-5	Far Field		ONBA	2010, 2013	4	0	non-detect	non-detect	S	None
699-19-43	Far Field		ONBA	2007, 2010, 2013	3	0	non-detect	non-detect	S	None
699-20-20	Far Field		IBD	2007, 2010, 2013	5	5	3.17	1.46	V	T
699-20-E120	Far Field		ONBA	2007-2014	9	0	non-detect	non-detect	S	None
699-20-E12S	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-20-E5A	Far Field		ONBA	2010	4	0	non-detect	non-detect	S	None
699-21-6	Far Field		OBD	2007, 2010, 2013	3	0	non-detect	non-detect	S	T
699-22-35	Far Field	SWL	ONBA	2007, 2009, 2012	3	0	non-detect	non-detect	S	None
699-2-3	Far Field		ONBA	2007, 2010, 2012	3	1	0.167	0.167	S	None
699-24-46	Far Field		ONBA	2007, 2008, 2009, 2012, 2013	6	0	non-detect	non-detect	S	None
699-26-15A	Far Field		IBD	2007, 2010, 2013	5	5	3.82	1.73	I	T
699-26-33	Far Field	NRDWL	IBD	2007-2013	8	5	1.66	1.3	S	T
699-26-35A	Far Field	NRDWL/SWL	OBD	2007, 2009, 2012	3	2	1.08	1.08	D	T
699-2-6A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-2-7	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-28-40	Far Field		OBD	2007, 2010, 2012	3	0	non-detect	non-detect	S	T
699-29-4	Far Field		OBD	2007, 2010, 2013	5	4	0.766	0.215	I	T
699-31-11	Far Field		IBD	2007, 2010, 2013	5	4	1.67	0.642	V	T
699-31-31	Far Field		OBD	2007, 2008, 2009,	6	1	0.222	0.222	V	T

Table A3-2. Well Network Analysis and Sampling Frequency Determination for Iodine-129 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (1 pCi/L = DWS)	Min Concentration pCi/L (1 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
				2010, 2011						
699-32-22A	Far Field		IBD	2007-2013	13	12	6.66	2.33	V	T
699-32-43	Far Field		OBD	2007-2013	9	7	1.46	0.536	V	T
699-33-56	Far Field		ONBA	2008	1	0	non-detect	non-detect	NA	None
699-34-41B	Far Field		IBD	2007, 2010, 2013	3	3	3.29	2.53	I	T
699-34-42	Far Field		IMCG	2007, 2011, 2013	3	3	2.66	2.04	D	T
699-35-9	Far Field		OBD	2007, 2010, 2013	5	4	0.739	0.561	S	T
699-37-43	Near Field		OBD	2007, 2010, 2013	3	2	0.585	0.473	V	T
699-37-47A	Near Field		IBD	2007-2013	7	7	4.04	1.19	V	A
699-37-E4	Far Field		ONBA	2007, 2010, 2013	3	1	0.168	0.168	V	None
699-38-15	Far Field		IBD	2007, 2010, 2013	5	4	2.16	1.52	V	T
699-39-39	Far Field	Ringold Confined	ONBA	2007, 2009, 2010, 2012, 2013	5	0	non-detect	non-detect	S	None
699-40-1	Far Field		ONBA	2007, 2010, 2013	3	2	0.551	0.324	S	None
699-40-33A	Far Field		OBD	2007, 2010, 2013	3	0	non-detect	non-detect	S	T
699-40-36	Far Field	Ringold Confined	ONBA	2010, 2012	2	0	non-detect	non-detect	S	None
699-41-1A	Far Field		ONBA	2007-2013	10	5	0.49	0.25	S	None
699-41-23	Far Field		IBD	2007-2013	10	9	6.32	2.4	V	T

Table A3-2. Well Network Analysis and Sampling Frequency Determination for Iodine-129 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (1 pCi/L = DWS)	Min Concentration pCi/L (1 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-41-40	Far Field	Ringold Confined	OBD	2007, 2010, 2013	5	3	1.04	0.812	S	T
699-41-42	Far Field		OBD	2009, 2010, 2011, 2012, 2013	5	5	3.52	0.848	D	BA
699-42-12A	Far Field		IBD	2007, 2010, 2013	5	4	2.06	0.994	I	T
699-42-39A	Far Field		ONBA	2007, 2010, 2013	3	2	0.445	0.24	D	None
699-42-39B	Far Field	Ringold Confined	ONBA	2007, 2010, 2013	3	1	0.34	0.34	S	None
699-42-42B	Far Field	216-B-3/Ringold Confined	OBD	2009, 2010, 2011, 2012, 2013	6	6	3.26	1.85	D	BA
699-43-3	Far Field		OBD	2007, 2010, 2013	3	2	0.559	0.217	V	T
699-43-44	Near Field	B Pond	IBD	2008, 2013	2	2	5.14	3.78	D	BA
699-43-45	Near Field	216-A-29/216-B-3	IBD	2007, 2008, 2009, 2011, 2012, 2013	8	8	9.98	6.82	V	BA
699-46-21B	Far Field		OBD	2007-2013	10	4	0.698	0.431	V	T
699-46-4	Far Field		ONBA	2007-2013	9	3	0.494	0.367	S	None
699-47-5	Far Field		ONBA	2007, 2010, 2013	3	2	0.553	0.259	V	None
699-48-7A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-49-13E	Far Field		ONBA	2007, 2013	3	0	non-detect	non-detect	S	None
699-52-19	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-8-17	Far Field		OBD	2007, 2009, 2012	3	0	non-detect	non-detect	S	T

Table A3-2. Well Network Analysis and Sampling Frequency Determination for Iodine-129 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (1 pCi/L = DWS)	Min Concentration pCi/L (1 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-8-25	Far Field		OBD	2007, 2010, 2013	5	0	non-detect	non-detect	S	T
699-9-E2	Far Field		ONBA	2012, 2013	2	1	0.342	0.342	V	None
699-S12-3	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S19-E13	Far Field		ONBA	2008	1	0	non-detect	non-detect	S	None
699-S19-E14	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S3-25	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-S3-E12	Far Field		ONBA	2008, 2010	4	0	non-detect	non-detect	S	None
699-S6-E14A	Far Field		ONBA	2009	1	0	non-detect	non-detect	NA	None
699-S8-19	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None

Note: Maximum values exceeding the DWS are bolded.

Drinking Water Standard (DWS)

Fast Flux Test Facility (FFTF)

Inside Plume-monitoring concentration gradients (IMCG)

Inside Plume-boundary definition (IBD)

Integrated Disposal Facility (IDF)

Method Detection Limit (MDL)

Not Available (NA)

Nonradioactive Dangerous Waste Landfill (NRDWL)

Outside Plume-boundary definition (OBD)

Outside Plume-monitoring encroaching plume (OMEP)

Outside Plume-non-boundary area (ONBA)

Outside Plume-monitoring potential source area (OMPSA)

Resource Conservation and Recovery Act of 1976 (RCRA)

Solid Waste Landfill (SWL)

Waste Management Area (WMA)

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E13-11	Far Field	BC_Cribs	ONBA	2008, 2009, 2011, 2012, 2013	6	0	non-detect	non-detect	S	None
299-E13-14	Far Field	BC_Cribs	ONBA	2007, 2008, 2010, 2011, 2012, 2013	7	1	190	190	S	None
299-E13-19	Far Field	BC_Cribs	ONBA	2008, 2009, 2010, 2011, 2012, 2013	6	0	non-detect	non-detect	S	None
299-E13-5	Far Field	BC_Cribs	ONBA	2007-2013	7	0	non-detect	non-detect	S	None
299-E16-2	Near Field		OBD	2007-2013	7	7	5,600	1,700	I	BA
299-E17-1	Near Field		IMCG	2008, 2009, 2010, 2012, 2013	6	6	610,000	310,000	I	A
299-E17-12	Near Field		IMCG	2007-2013	7	7	68,000	36,000	D	T
299-E17-13	Near Field		IMCG	2007-2013	7	7	100,000	45,000	D	T
299-E17-14	Near Field	216-A-36B	IMCG	2007-2013	11	11	650,000	420,000	D	A
299-E17-16	Near Field	216-A-36B	IMCG	2007-2013	7	7	190,000	87,000	V	T
299-E17-18	Near Field	216-A-36B	IMCG	2007-2013	7	7	96,000	39,000	D	T
299-E17-19	Near Field	216-A-36B	IMCG	2007-2013	8	8	560,000	300,000	V	A
299-E17-21	Near Field		OBD	2008	1	1	17,000	17,000	NA	BA
299-E17-22	Near Field	IDF	IMCG	no data	no data	no data	no data	no data	NA	T

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E17-23	Near Field	IDF	IMCG	2007, 2008, 2009, 2011, 2012, 2013	7	7	41,000	16,000	I	A
299-E17-25	Near Field	IDF	IBD	2007, 2008, 2009, 2011, 2012, 2013	6	6	61,000	22,000	I	A
299-E17-26	Near Field	IDF	IBD	no data	no data	no data	no data	no data	NA	A
299-E18-1	Near Field	IDF	ONBA	2007, 2008, 2009, 2011, 2012, 2013	7	5	434	240	D	None
299-E23-1	Near Field		OBD	2007, 2008, 2009, 2012	8	8	9,300	1,600	D	T
299-E24-16	Near Field		IMCG	2008, 2009, 2010, 2011, 2012, 2013	6	6	290,000	180,000	D	T
299-E24-18	Near Field		IBD	2007-2013	7	7	66,300	11,000	D	A
299-E24-20	Near Field	WMA_A_AX	ONBA	2007, 2008, 2010, 2011, 2012, 2013	9	9	8,700	4,800	V	None
299-E24-21	Near Field	IDF	IBD	no data	no data	no data	no data	no data	NA	A
299-E24-22	Near Field	WMA_A_AX	ONBA	2008, 2009, 2010, 2011, 2012, 2013	9	9	2,400	1,100	D	None
299-E24-23	Near Field		IMCG	2007, 2008, 2009, 2012, 2013	6	6	540,000	160,000	D	A

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299E24-24	Near Field	IDF	OBD	no data	no data	no data	no data	no data	NA	BA
299E24-33	Near Field	WMA_A_AX	ONBA	2007, 2008, 2009, 2011, 2012, 2013	8	8	3,580	1,700	D	None
299-E24-5	Near Field		OBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	2,200	1,100	V	T
299E25-17	Near Field	216-A-37-1	OBD	2007-2013	7	7	6,700	5,100	I	BA
299E25-18	Near Field		OBD	2007-2013	7	7	8,700	5,400	I	BA
299E25-19	Near Field	216-A-37-1	IBD	2007-2013	8	8	180,000	120,000	V	BA
299-E25-2	Near Field	WMA_A_AX	ONBA	2007, 2008, 2009, 2011, 2012, 2013	7	7	7,100	5,300	V	None
299E25-20	Near Field	216-A-37-1	IBD	2007-2013	9	9	255,000	150,000	S	BA
299E25-22	Near Field		IBD	2007-2013	7	7	28,000	16,300	I	A
299E25-26	Near Field	216-A-29	ONBA	2009, 2013	3	3	5,200	3,000	I	None
299E25-28	Near Field	216-A-29	OBD	2007-2013	13	13	9,500	1,700	V	BA
299E25-29P	Near Field		OBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	8,380	3,600	D	BA
299E25-29Q	Near Field		OBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	20,400	9,100	D	BA

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E25-3	Near Field		OBD	2007, 2008, 2009, 2010, 2012, 2013	6	6	5,000	3,590	I	BA
299-E25-32P	Near Field	216-A-29	ONBA	2007, 2009, 2010, 2011, 2012, 2013	6	6	4,800	3,200	V	None
299-E25-32Q	Near Field		ONBA	2007, 2009, 2010, 2011, 2012, 2013	6	6	4,400	3,100	V	None
299-E25-34	Near Field	216-A-29	ONBA	2007, 2009, 2010, 2011, 2012, 2013	7	6	690	343	I	None
299-E25-35	Near Field	216-A-29	OBD	2007, 2009, 2010, 2011, 2012, 2013	9	9	14,000	8,500	V	BA
299-E25-36	Near Field		IBD	2007-2013	7	7	210,000	7,700	D	A
299-E25-37	Near Field		ONBA	2007, 2009, 2010, 2011, 2012, 2013	6	6	1,400	280	V	None
299-E25-39	Near Field		OBD	2008	1	1	23,000	23,000	NA	BA
299-E25-40	Near Field	WMA_A_AX	ONBA	2007, 2008, 2010, 2011, 2012, 2013	10	10	5,400	3,000	D	None
299-E25-41	Near Field	WMA_A_AX	ONBA	2007, 2008, 2010, 2011, 2012, 2013	8	8	6,400	3,300	D	None

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E25-42	Near Field		ONBA	2007-2013	7	7	15,000	10,000	I	None
299-E25-43	Near Field		OBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	3,800	2,200	D	BA
299-E25-44	Near Field		OBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	2,930	1,800	D	T
299-E25-47	Near Field	216-A-37-1	OBD	2007, 2009, 2010, 2011, 2012, 2013	6	5	23,800	11,000	D	BA
299-E25-48	Near Field	216-A-29	ONBA	2009, 2010, 2012, 2013	5	5	5,200	4,700	S	None
299-E25-6	Near Field		OBD	2007-2013	7	7	11,000	7,400	I	BA
299-E25-93	Near Field	WMA_A_AX	ONBA	2007-2013	7	7	5,100	3,800	D	None
299-E25-94	Near Field	WMA_A_AX	ONBA	2007-2013	8	8	4,300	3,500	S	None
299-E26-4	Near Field		IBD	2007, 2008, 2009, 2010, 2012, 2013	6	6	45,200	33,000	D	A
299-E26-12	Near Field	216-A-29	ONBA	2009, 2010, 2011, 2012, 2013	6	6	2,700	2,000	I	None
299-E26-13	Near Field	216-A-29	ONBA	2009, 2010, 2012, 2013	6	6	4,700	3,800	I	None
499-S0-7	Far Field	FFTF	IBD	2007, 2008, 2009, 2010, 2012	15	15	11,000	1,900	V	T

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
499-S0-8	Far Field	FFTF	IBD	2007, 2008, 2009, 2010, 2012	13	13	12,000	1,800	V	T
499-S1-8J	Far Field	FFTF	IBD	2007, 2008, 2009, 2010, 2012	14	14	3,600	1,600	S	T
699-10-54A	Far Field		ONBA	2007-2013	10	0	non-detect	non-detect	S	None
699-10-E12	Far Field		OBD	2007-2013	9	8	14,000	7,700	D	T
699-14-38	Far Field		OBD	2007, 2010, 2013	6	0	non-detect	non-detect	S	T
699-17-5	Far Field		OBD	2010, 2013	4	4	5,100	3,900	V	T
699-19-43	Far Field		ONBA	2007, 2010, 2013	3	0	non-detect	non-detect	S	None
699-20-20	Far Field		IBD	2007, 2010, 2013	5	5	62,700	41,000	D	T
699-20-E120	Far Field		OBD	2007-2014	9	5	3,320	380	D	T
699-20-E12S	Far Field		OBD	2007, 2010, 2013	3	0	non-detect	non-detect	S	T
699-20-E5A	Far Field		IBD	2007, 2010, 2013	6	6	48,900	28,000	D	T
699-21-6	Far Field		IBD	2007, 2010, 2013	3	3	33,000	23,900	I	T
699-22-35	Far Field	SWL	ONBA	2007, 2009, 2012	3	0	non-detect	non-detect	S	None

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-2-3	Far Field		IBD	2007, 2010, 2012	3	3	39,000	29,000	D	T
699-24-46	Far Field		ONBA	2007, 2008, 2009, 2012, 2013	6	0	non-detect	non-detect	S	None
699-26-15A	Far Field		IMCG	2007, 2010, 2013	5	5	81,100	54,000	D	T
699-26-33	Far Field	NRDWL	IBD	2007-2013	8	8	31,000	22,000	D	T
699-26-35A	Far Field	NRDWL/SWL	OBD	2007, 2009, 2012	3	3	21,000	18,000	D	T
699-2-6A	Far Field		IMCG	2007-2013	7	7	26,000	20,000	V	T
699-2-7	Far Field		IMCG	2007, 2008, 2009, 2011, 2012, 2013	6	6	11,000	7,000	D	T
699-28-40	Far Field		OBD	2007, 2010, 2012	3	2	630	610	I	T
699-29-4	Far Field		IBD	2007, 2010, 2013	5	5	87,100	56,000	D	T
699-31-11	Far Field		IMCG	2007, 2010, 2013	5	5	79,500	53,000	D	T
699-31-31	Far Field		OBD	2007, 2008, 2009, 2010, 2011	6	6	3,900	1,200	D	T
699-32-22A	Far Field		IBD	2007-2013	13	13	46,000	32,000	D	T
699-32-43	Far Field		IBD	2007-2013	9	9	23,800	20,000	S	T

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-33-56	Far Field		OBD	2007, 2008, 2010, 2013	4	1	7,400	7,400	V	T
699-34-1B	Far Field		IBD	2007, 2010, 2013	3	3	48,300	35,000	D	T
699-34-42	Far Field		IMCG	2007, 2011, 2013	3	3	37,100	24,000	V	T
699-35-9	Far Field		IMCG	2007, 2010, 2013	5	5	97,000	67,000	D	T
699-37-43	Near Field		OBD	2007, 2010, 2013	3	3	15,000	10,000	D	T
699-37-47A	Near Field		IBD	2007-2013	7	7	43,000	39,000	S	T
699-37-E4	Far Field		IBD	2007, 2010, 2013	3	3	62,000	57,000	D	T
699-38-15	Far Field		IBD	2007, 2010, 2013	5	5	65,000	44,000	D	T
699-39-39	Far Field	Ringold Confined	OBD	2007, 2009, 2010, 2012, 2013	5	0	non-detect	non-detect	S	T
699-40-1	Far Field		IBD	2007, 2010, 2013	3	3	59,000	47,000	D	T
699-40-33A	Far Field		ONBA	2007, 2010, 2013	3	0	non-detect	non-detect	S	None
699-40-36	Far Field	Ringold Confined	ONBA	2007, 2008, 2009, 2010, 2011, 2012	7	0	non-detect	non-detect	S	None

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-41-1A	Far Field		IMCG	2007-2013	10	10	67,500	41,000	D	T
699-41-23	Far Field		OBD	2007-2013	10	10	9,440	7,800	V	T
699-41-40	Far Field	Ringold Confined	IBD	2007, 2010, 2013	5	5	47,000	33,000	D	T
699-41-42	Far Field		IBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	27,000	21,000	V	T
699-42-12A	Far Field		IBD	2007, 2010, 2013	5	5	40,000	26,000	D	T
699-42-39A	Far Field		OBD	2007, 2010, 2013	3	3	12,000	6,200	D	T
699-42-39B	Far Field	Ringold Confined	OBD	2007, 2010, 2013	3	3	18,000	11,000	D	T
699-42-42B	Far Field	216-B-3/Ringold Confined	OBD	2007, 2009, 2010, 2011, 2012, 2013	9	9	17,000	5,550	V	T
699-43-3	Far Field		IMCG	2007, 2010, 2013	3	3	70,000	53,000	D	T
699-43-44	Near Field	B Pond	OBD	2011, 2012, 2013	3	3	16,400	4,800	D	T
699-43-45	Near Field	216-A-29/216-B-3	ONBA	2007-2013	16	16	1,300	670	V	None
699-46-21B	Far Field		IBD	2007-2013	10	10	41,700	31,000	D	T
699-46-4	Far Field		IMCG	2007-2013	9	9	53,300	25,000	D	T

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-47-5	Far Field		IBD	2007, 2010, 2013	3	3	30,000	9,600	D	T
699-48-7A	Far Field		OBD	2007, 2010, 2013	3	0	non-detect	non-detect	S	T
699-49-13E	Far Field		OBD	2007, 2013	3	1	420	420	V	T
699-52-19	Far Field		OBD	2007, 2010, 2013	3	0	non-detect	non-detect	S	T
699-8-17	Far Field		IBD	2007, 2009, 2012	3	3	33,000	24,000	D	T
699-8-25	Far Field		OBD	2007, 2010, 2013	5	5	2,850	1,300	V	T
699-9-E2	Far Field		OBD	2007, 2012, 2013	3	3	2,500	1,300	D	T
699-S12-3	Far Field		OBD	2007	1	1	583	583	S	T
699-S19-E13	Far Field		ONBA	2007, 2008, 2009, 2010, 2012, 2014	8	8	9,900	6,100	D	None
699-S19-E14	Far Field		ONBA	2007, 2010, 2013	3	3	13,000	9,600	D	None
699-S3-25	Far Field		OBD	2007, 2010, 2013	5	0	non-detect	non-detect	S	T
699-S3-E12	Far Field		ONBA	2007-2013	10	8	1,900	290	V	None
699-S6-E14A	Far Field		ONBA	2007, 2009, 2010, 2013	4	4	2,100	310	V	None

Table A3-3. Well Network Analysis and Sampling Frequency Determination for Tritium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (20,000 pCi/L = DWS)	Min Concentration pCi/L (20,000 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-S8-19	Far Field		OBD	2007, 2008, 2010, 2013	6	0	non-detect	non-detect	S	T

Note: Maximum values exceeding the DWS are bolded.

Drinking Water Standard (DWS)

Fast Flux Test Facility (FFTF)

Inside Plume-monitoring concentration gradients (IMCG)

Inside Plume-boundary definition (IBD)

Integrated Disposal Facility (IDF)

Method Detection Limit (MDL)

Not Available (NA)

Nonradioactive Dangerous Waste Landfill (NRDWL)

Outside Plume-boundary definition (OBD)

Outside Plume-monitoring encroaching plume (OMEP)

Outside Plume-non-boundary area (ONBA)

Outside Plume-monitoring potential source area (OMPSA)

Resource Conservation and Recovery Act of 1976 (RCRA)

Solid Waste Landfill (SWL)

Waste Management Area (WMA)

Table A3-4. Well Network Analysis and Sampling Frequency Determination for Uranium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration µg/L (30 µg/L = DWS)	Min Concentration µg/L (30 µg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E13-11	Far Field	BC_Cribs	ONBA	2008, 2009, 2011, 2012, 2013	6	6	3.62	2.84	S	None
299-E13-14	Far Field	BC_Cribs	ONBA	2007, 2008, 2010, 2011, 2012, 2013	7	7	3.02	1.56	V	None
299-E13-19	Far Field	BC_Cribs	ONBA	2008, 2009, 2010, 2011, 2012, 2013	6	6	4.38	3.51	V	None
299-E13-5	Far Field	BC_Cribs	ONBA	2007-2013	7	7	3.94	2.92	S	None
299-E16-2	Near Field		ONBA	None	None	None	None	None	None	None
299-E17-1	Near Field		ONBA	2008, 2009, 2010, 2012, 2013	6	6	13.8	7.25	D	None
299-E17-12	Near Field		ONBA	None	None	None	None	None	None	None
299-E17-13	Near Field		ONBA	2011, 2012, 2013	3	3	9.01	8.37	S	None
299-E17-14	Near Field	216-A-36B	IBD	2007-2013	10	10	31.7	25.4	V	A
299-E17-16	Near Field	216-A-36B	OBD	2008, 2009, 2010, 2011, 2012, 2013	6	6	20.3	13	V	A
299-E17-18	Near Field	216-A-36B	ONBA	2008, 2009, 2010, 2011, 2012, 2013	6	6	13.2	10.1	D	None

Table A3-4. Well Network Analysis and Sampling Frequency Determination for Uranium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration $\mu\text{g/L}$ (30 $\mu\text{g/L}$ = DWS)	Min Concentration $\mu\text{g/L}$ (30 $\mu\text{g/L}$ = DWS)	Concentration Trending (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E17-19	Near Field	216-A-36B	OBD	2008, 2009, 2010, 2011, 2012, 2013	7	7	13.1	7.21	I	A
299-E17-21	Near Field		ONBA	2008	1	1	4.16	4.16	NA	None
299-E17-22	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E17-23	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E17-25	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E17-26	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E18-1	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E23-1	Near Field		ONBA	2007, 2008	3	3	13.1	7.53	V	None
299-E24-16	Near Field		OBD	2008, 2009, 2010, 2011, 2012, 2013	6	6	28.5	19.9	D	A
299-E24-18	Near Field		ONBA	2008, 2009, 2010, 2011, 2012, 2013	6	6	14.4	5.34	V	None
299-E24-20	Near Field	WMA_A_AX	ONBA	2008	1	1	2.38	2.38	NA	None
299-E24-21	Near Field	IDF	ONBA	None	None	None	None	None	None	None
299-E24-22	Near Field	WMA_A_AX	ONBA	2008	1	1	2.48	2.48	NA	None
299-E24-23	Near Field		IBD	2007, 2008, 2009, 2012, 2013	5	5	106	3	V	A
299-E24-24	Near Field	IDF	ONBA	None	None	None	None	None	None	None

Table A3-4. Well Network Analysis and Sampling Frequency Determination for Uranium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration µg/L (30 µg/L = DWS)	Min Concentration µg/L (30 µg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E24-33	Near Field	WMA_A_AX	ONBA	2008	2	2	2.71	2.43	S	None
299-E24-5	Near Field		ONBA	None	None	None	None	None	None	None
299-E25-17	Near Field	216-A-37-1	ONBA	2012, 2013	2	2	2.54	2.46	S	None
299-E25-18	Near Field		ONBA	None	None	None	None	None	None	None
299-E25-19	Near Field	216-A-37-1	ONBA	None	None	None	None	None	None	None
299-E25-2	Near Field	WMA_A_AX	ONBA	2007	1	1	2.54	2.54	NA	None
299-E25-20	Near Field	216-A-37-1	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-22	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-26	Near Field	216-A-29	ONBA	2013	1	1	1.76	1.76	NA	None
299-E25-28	Near Field	216-A-29	ONBA	2012, 2013	3	3	2.51	2.27	I	None
299-E25-29P	Near Field		ONBA	None	None	None	None	None	None	None
299-E25-29Q	Near Field		ONBA	None	None	None	None	None	None	None
299-E25-3	Near Field		OBD	2012, 2013	2	2	3.34	3.12	I	BA
299-E25-32P	Near Field	216-A-29	ONBA	2012, 2013	2	2	2.74	2.61	S	None
299-E25-32Q	Near Field		ONBA							None
299-E25-34	Near Field	216-A-29	ONBA	2012, 2013	2	2	2.06	1.83	D	None
299-E25-35	Near Field	216-A-29	ONBA	2012, 2013	2	2	2.56	2.47	S	None
299-E25-36	Near Field		IBD	2007, 2009, 2010, 2011, 2012, 2013	6	6	75.4	58.8	D	A

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Table A3-4. Well Network Analysis and Sampling Frequency Determination for Uranium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration $\mu\text{g/L}$ (30 $\mu\text{g/L}$ = DWS)	Min Concentration $\mu\text{g/L}$ (30 $\mu\text{g/L}$ = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E25-37	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-39	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-40	Near Field	WMA_A_AX	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-41	Near Field	WMA_A_AX	ONBA	2008	1	1	2.79	2.79	NA	None
299-E25-42	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-43	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-44	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-47	Near Field	216-A-37-1	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-48	Near Field	216-A-29	ONBA	2012, 2013	2	2	4.53	4.22	I	None
299-E25-6	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-93	Near Field	WMA_A_AX	ONBA	2007, 2008	2	2	2.43	2.32	S	None
299-E25-94	Near Field	WMA_A_AX	ONBA	2008	1	1	1.89	1.89	NA	None
299-E26-4	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E26-12	Near Field	216-A-29	ONBA	2012, 2013	3	3	2.53	2.02	V	None
299-E26-13	Near Field	216-A-29	ONBA	2012, 2013	3	3	3.42	2.86	I	None
499-S0-7	Far Field	FFTF	ONBA	2009, 2010, 2012	6	6	3.55	0.699	V	None
499-S0-8	Far Field	FFTF	ONBA	2009, 2010, 2012	6	6	5.17	0.0938	V	None

Table A3-4. Well Network Analysis and Sampling Frequency Determination for Uranium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration $\mu\text{g/L}$ (30 $\mu\text{g/L}$ = DWS)	Min Concentration $\mu\text{g/L}$ (30 $\mu\text{g/L}$ = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
499-S1-8J	Far Field	FFTF	ONBA	2007, 2008, 2009, 2010, 2012	9	4	0.456	0.0799	V	None
699-10-54A	Far Field		ONBA	2008	1	1	1.8	1.8	NA	None
699-10-E12	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-14-38	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-17-5	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-19-43	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-20-20	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-20-E120	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-20-E12S	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-20-E5A	Far Field		ONBA	2010	3	3	4.91	4.31	I	None
699-21-6	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-22-35	Far Field	SWL	ONBA	no data	no data	no data	no data	no data	NA	None
699-2-3	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-24-46	Far Field		ONBA	2008	1	1	1.55	1.55	NA	None
699-26-15A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-26-33	Far Field	NRDWL	ONBA	2008	1	1	8.04	8.04	NA	None
699-26-35A	Far Field	NRDWL/SWL	ONBA	no data	no data	no data	no data	no data	NA	None
699-2-6A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None

Table A3-4. Well Network Analysis and Sampling Frequency Determination for Uranium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration $\mu\text{g/L}$ (30 $\mu\text{g/L}$ = DWS)	Min Concentration $\mu\text{g/L}$ (30 $\mu\text{g/L}$ = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-2-7	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-28-40	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-29-4	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-31-11	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-31-31	Far Field		ONBA	2009	1	1	0.29	0.29	NA	None
699-32-22A	Far Field		ONBA	2008	1	1	2.7	2.7	NA	None
699-32-43	Far Field		ONBA	2008	1	1	6.79	6.79	NA	None
699-33-56	Far Field		ONBA	2008	1	1	3.28	3.28	NA	None
699-34-41B	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-34-42	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-35-9	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-37-43	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-37-47A	Near Field		OBD	2009, 2010, 2011, 2012, 2013	5	5	7.37	3.48	I	BA
699-37-E4	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-38-15	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-39-39	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-40-1	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-40-33A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None

Table A3-4. Well Network Analysis and Sampling Frequency Determination for Uranium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration µg/L (30 µg/L = DWS)	Min Concentration µg/L (30 µg/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-40-36	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-41-1A	Far Field		ONBA	2008, 2013	3	3	4.44	3.24	V	None
699-41-23	Far Field		ONBA	2008	1	1	1.18	1.18	NA	None
699-41-40	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-41-42	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-42-12A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-42-39A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-42-39B	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-42-42B	Far Field	216-B-3/Ringold Confined	ONBA	2011, 2012	2	2	3.82	3.57	I	None
699-43-3	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-43-44	Near Field	B Pond	ONBA	no data	no data	no data	no data	no data	NA	None
699-43-45	Near Field	216-A-29/216-B-3	ONBA	2011, 2012, 2013	5	5	2.75	1.87	V	None
699-46-21B	Far Field		ONBA	2008	1	1	2.81	2.81	NA	None
699-46-4	Far Field		ONBA	2008, 2013	3	3	3.53	3.27	S	None
699-47-5	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-48-7A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-49-13E	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-52-19	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None

Table A3-4. Well Network Analysis and Sampling Frequency Determination for Uranium Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration $\mu\text{g/L}$ (30 $\mu\text{g/L}$ = DWS)	Min Concentration $\mu\text{g/L}$ (30 $\mu\text{g/L}$ = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-8-17	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-8-25	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-9-E2	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S12-3	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S19-E13	Far Field		ONBA	2008	1	1	6.18	6.18	NA	None
699-S19-E14	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S3-25	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S3-E12	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S6-E14A	Far Field		ONBA	2009	1	1	6.35	6.35	NA	None
699-S8-19	Far Field		ONBA	2010	3	3	4.55	4.1	V	None

Note: Maximum values exceeding the DWS are bolded.

Drinking Water Standard (DWS)

Fast Flux Test Facility (FFTF)

Inside Plume-monitoring concentration gradients (IMCG)

Inside Plume-boundary definition (IBD)

Integrated Disposal Facility (IDF)

Method Detection Limit (MDL)

Not Available (NA)

Nonradioactive Dangerous Waste Landfill (NRDWL)

Outside Plume-boundary definition (OBD)

Outside Plume-monitoring encroaching plume (OMEPP)

Outside Plume-non-boundary area (ONBA)

Outside Plume-monitoring potential source area (OMPSA)

Resource Conservation and Recovery Act of 1976 (RCRA)

Solid Waste Landfill (SWL)

Waste Management Area (WMA)

Table A3-5. Well Network Analysis and Sampling Frequency Determination for Strontium-90 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (8 pCi/L = DWS)	Min Concentration pCi/L (8 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E13-11	Far Field	BC_Cribs	ONBA	2008, 2009, 2011, 2012, 2013	6	2	2.4	2.2	V	None
299-E13-14	Far Field	BC_Cribs	ONBA	2007, 2008, 2010, 2011, 2012, 2013	7	0	non-detect	non-detect	S	None
299-E13-19	Far Field	BC_Cribs	ONBA	2008, 2009, 2010, 2011, 2012, 2013	6	0	non-detect	non-detect	S	None
299-E13-5	Far Field	BC_Cribs	ONBA	2007-2013	7	1	0.64	0.64	S	None
299-E16-2	Near Field		ONBA	2007-2013	7	1	2.1	2.1	V	None
299-E17-1	Near Field		ONBA	2008, 2009, 2010, 2012, 2013	6	2	1.7	1.2	I	None
299-E17-12	Near Field		ONBA	2007-2013	7	0	non-detect	non-detect	S	None
299-E17-13	Near Field		ONBA	2007-2013	7	0	non-detect	non-detect	S	None
299-E17-14	Near Field	216-A-36B	IBD	2007-2013	11	11	30	11	V	A
299-E17-16	Near Field	216-A-36B	OBD	2007-2013	7	4	3.5	1.4	V	BA
299-E17-18	Near Field	216-A-36B	OBD	2007-2013	7	2	2.7	1	V	BA
299-E17-19	Near Field	216-A-36B	OBD	2007-2013	8	5	2.3	1.26	V	BA

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Table A3-5. Well Network Analysis and Sampling Frequency Determination for Strontium-90 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (8 pCi/L = DWS)	Min Concentration pCi/L (8 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E17-21	Near Field		ONBA	2008	1	0	non-detect	non-detect	NA	None
299-E17-22	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E17-23	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E17-25	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E17-26	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E18-1	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E23-1	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E24-16	Near Field		OBD	2008, 2009, 2010, 2011, 2012, 2013	6	5	7.8	3.7	V	BA
299-E24-18	Near Field		ONBA	2007-2013	7	0	non-detect	non-detect	S	None
299-E24-20	Near Field	WMA_A_AX	ONBA	2007, 2008, 2010, 2011, 2012, 2013	8	0	non-detect	non-detect	S	None
299-E24-21	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E24-22	Near Field	WMA_A_AX	ONBA	2008, 2009, 2010, 2011, 2012, 2013	9	0	non-detect	non-detect	S	None

Table A3-5. Well Network Analysis and Sampling Frequency Determination for Strontium-90 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (8 pCi/L = DWS)	Min Concentration pCi/L (8 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E24-23	Near Field		OBD	2007, 2008, 2009, 2012, 2013	6	2	2.8	1.6	I	BA
299-E24-24	Near Field	IDF	ONBA	no data	no data	no data	no data	no data	NA	None
299-E24-33	Near Field	WMA_A_AX	ONBA	2007, 2008, 2009, 2011, 2012, 2013	8	0	non-detect	non-detect	S	None
299-E24-5	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-17	Near Field	216-A-37-1	ONBA	2007-2013	7	1	2.8	2.8	V	None
299-E25-18	Near Field		ONBA	2007-2013	7	1	2.7	2.7	V	None
299-E25-19	Near Field	216-A-37-1	ONBA	2007-2013	8	1	1.8	1.8	V	None
299-E25-2	Near Field	WMA_A_AX	ONBA	2007, 2008, 2009, 2011, 2012, 2013	7	0	non-detect	non-detect	S	None
299-E25-20	Near Field	216-A-37-1	ONBA	2007-2013	9	1	1.7	1.7	V	None
299-E25-22	Near Field		ONBA	2007-2013	7	1	3.2	3.2	V	None
299-E25-26	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-28	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None

Table A3-5. Well Network Analysis and Sampling Frequency Determination for Strontium-90 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (8 pCi/L = DWS)	Min Concentration pCi/L (8 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E25-29P	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-29Q	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-3	Near Field		ONBA	2007, 2008, 2009, 2010, 2012, 2013	6	0	non-detect	non-detect	S	None
299-E25-32P	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-32Q	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-34	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-35	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-36	Near Field		ONBA	2007-2013	7	0	non-detect	non-detect	S	None
299-E25-37	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-39	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-40	Near Field	WMA_A_AX	ONBA	2007, 2008, 2010, 2011, 2012, 2013	10	0	non-detect	non-detect	S	None
299-E25-41	Near Field	WMA_A_AX	ONBA	2007, 2008, 2010, 2011, 2012, 2013	8	1	2.2	2.2	V	None

Table A3-5. Well Network Analysis and Sampling Frequency Determination for Strontium-90 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (8 pCi/L = DWS)	Min Concentration pCi/L (8 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E25-42	Near Field		ONBA	2007-2013	7	0	non-detect	non-detect	S	None
299-E25-43	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-44	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-47	Near Field	216-A-37-1	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-48	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-6	Near Field		ONBA	2007-2013	7	0	non-detect	non-detect	S	None
299-E25-93	Near Field	WMA_A_AX	OMPSA	2007-2013	7	2	5.8	0.773	V	T
299-E25-94	Near Field	WMA_A_AX	OMPSA	2007-2013	8	2	4.5	1.1	V	T
299-E26-4	Near Field		ONBA	2007, 2008, 2009, 2010, 2012, 2013	6	0	non-detect	non-detect	S	None
299-E26-12	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E26-13	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
499-S0-7	Far Field	FFTF	ONBA	2009, 2010, 2012	6	0	non-detect	non-detect	S	None
499-S0-8	Far Field	FFTF	ONBA	2009, 2010, 2012	6	0	non-detect	non-detect	S	None

Table A3-5. Well Network Analysis and Sampling Frequency Determination for Strontium-90 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (8 pCi/L = DWS)	Min Concentration pCi/L (8 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
499-S1-8J	Far Field	FFTF	ONBA	2007, 2008, 2009, 2010, 2012	10	0	non-detect	non-detect	S	None
699-10-54A	Far Field		ONBA	2007-2013	10	0	non-detect	non-detect	S	None
699-10-E12	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-14-38	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-17-5	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-19-43	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-20-20	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-20-E120	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-20-E12S	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-20-E5A	Far Field		ONBA	2010	4	0	non-detect	non-detect	S	None
699-21-6	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-22-35	Far Field	SWL	ONBA	no data	no data	no data	no data	no data	NA	None
699-2-3	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-24-46	Far Field		ONBA	2007, 2008, 2009, 2012, 2013	6	0	non-detect	non-detect	S	None
699-26-15A	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-26-33	Far Field	NRDWL	ONBA	2007-2013	8	0	non-detect	non-detect	S	None
699-26-35A	Far Field	NRDWL/SWL	ONBA	no data	no data	no data	no data	no data	NA	None
699-2-6A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None

Table A3-5. Well Network Analysis and Sampling Frequency Determination for Strontium-90 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (8 pCi/L = DWS)	Min Concentration pCi/L (8 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-2-7	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-28-40	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-29-4	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-31-11	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-31-31	Far Field		ONBA	2007, 2008, 2009, 2010, 2011	6	1	4.7	4.7	V	None
699-32-22A	Far Field		ONBA	2007-2013	13	0	non-detect	non-detect	S	None
699-32-43	Far Field		ONBA	2007-2013	9	0	non-detect	non-detect	S	None
699-33-56	Far Field		ONBA	2008	1	0	non-detect	non-detect	NA	None
699-34-41B	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-34-42	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-35-9	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-37-43	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-37-47A	Near Field		OBD	2007-2013	7	1	1.4	1.4	V	T
699-37-E4	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-38-15	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-39-39	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-40-1	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None

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Table A3-5. Well Network Analysis and Sampling Frequency Determination for Strontium-90 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (8 pCi/L = DWS)	Min Concentration pCi/L (8 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-40-33A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-40-36	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-41-1A	Far Field		ONBA	2007-2013	10	1	2.5	2.5	V	None
699-41-23	Far Field		ONBA	2007-2013	10	0	non-detect	non-detect	S	None
699-41-40	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-41-42	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-42-12A	Far Field		ONBA	2010	3	0	non-detect	non-detect	NA	None
699-42-39A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-42-39B	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-42-42B	Far Field	216-B-3/Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-43-3	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-43-44	Near Field	B Pond	ONBA	no data	no data	no data	no data	no data	NA	None
699-43-45	Near Field	216-A-29/216-B-3	ONBA	no data	no data	no data	no data	no data	NA	None
699-46-21B	Far Field		ONBA	2007-2013	10	0	non-detect	non-detect	S	None
699-46-4	Far Field		ONBA	2007-2013	9	1	4.7	4.7	V	None
699-47-5	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None

Table A3-5. Well Network Analysis and Sampling Frequency Determination for Strontium-90 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (8 pCi/L = DWS)	Min Concentration pCi/L (8 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-48-7A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-49-13E	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-52-19	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-8-17	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-8-25	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-9-E2	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S12-3	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S19-E13	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S19-E14	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S3-25	Far Field		ONBA	2010	3	1	2	2	V	None
699-S3-E12	Far Field		ONBA	2007-2013	10	0	non-detect	non-detect	S	None
699-S6-E14A	Far Field		ONBA	2009	1	0	non-detect	non-detect	NA	None
699-S8-19	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None

Table A3-5. Well Network Analysis and Sampling Frequency Determination for Strontium-90 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (8 pCi/L = DWS)	Min Concentration pCi/L (8 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
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Note: Maximum values exceeding the DWS are bolded.

Drinking Water Standard (DWS)

Fast Flux Test Facility (FFTF)

Inside Plume-monitoring concentration gradients (IMCG)

Inside Plume-boundary definition (IBD)

Integrated Disposal Facility (IDF)

Not Available (NA)

Nonradioactive Dangerous Waste Landfill (NRDWL)

Outside Plume-boundary definition (OBD)

Outside Plume-monitoring encroaching plume (OMEP)

Outside Plume-non-boundary area (ONBA)

Outside Plume-monitoring potential source area (OMPSA)

Resource Conservation and Recovery Act of 1976 (RCRA)

Solid Waste Landfill (SWL)

Waste Management Area (WMA)

Table A3-6. Well Network Analysis and Sampling Frequency Determination for Technium-99 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (900 pCi/L = DWS)	Min Concentration pCi/L (900 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E13-11	Far Field	BC_Cribs	ONBA	2008, 2009, 2011, 2012, 2013	6	0	non-detect	non-detect	S	None
299-E13-14	Far Field	BC_Cribs	ONBA	2007, 2008, 2010, 2011, 2012, 2013	7	0	non-detect	non-detect	S	None
299-E13-19	Far Field	BC_Cribs	ONBA	2008, 2009, 2010, 2011, 2012, 2013	6	0	non-detect	non-detect	S	None
299-E13-5	Far Field	BC_Cribs	ONBA	2007-2013	7	0	non-detect	non-detect	S	None
299-E16-2	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E17-1	Near Field		OBD	2008, 2009, 2010, 2012, 2013	6	6	130	22	V	T
299-E17-12	Near Field		ONBA	None	None	None	None	None	None	None
299-E17-13	Near Field		ONBA	None	None	None	None	None	None	None
299-E17-14	Near Field	216-A-36B	OBD	2008, 2009, 2010, 2011, 2012, 2013	7	7	140	39	V	T
299-E17-16	Near Field	216-A-36B	ONBA	2009, 2010, 2011, 2012, 2013	5	5	38	14	I	None
299-E17-18	Near Field	216-A-36B	ONBA	2009, 2010, 2011, 2012, 2013	5	4	27	12	I	None
299-E17-19	Near Field	216-A-36B	OBD	2009, 2010, 2011, 2012, 2013	6	6	90	21	I	T
299-E17-21	Near Field		ONBA	2008, 2011, 2012	3	1	7.7	7.7	I	None
299-E17-22	Near Field	IDF	ONBA	2007-2013	14	14	23	11	V	None
299-E17-23	Near Field	IDF	ONBA	2007-2013	10	3	13	7.1	V	None

Table A3-6. Well Network Analysis and Sampling Frequency Determination for Technium-99 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (900 pCi/L = DWS)	Min Concentration pCi/L (900 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E17-25	Near Field	IDF	ONBA	2007-2013	9	5	26	6.8	V	None
299-E17-26	Near Field	IDF	ONBA	2007-2013	9	5	17	8.3	V	None
299-E18-1	Near Field	IDF	ONBA	2007-2013	9	0	non-detect	non-detect	S	None
299-E23-1	Near Field		ONBA	2007, 2008	3	3	38.3	28.1	S	None
299-E24-16	Near Field		ONBA	2008, 2009, 2010, 2011, 2012, 2013	6	6	62	22.2	I	None
299-E24-18	Near Field		ONBA	2009, 2010, 2011, 2012, 2013	5	4	48	8.4	I	None
299-E24-20	Near Field	WMA_A_AX	OBD	2007-2013	29	29	380	63	I	A
299-E24-21	Near Field	IDF	ONBA	2007-2013	9	9	38	15	V	None
299-E24-22	Near Field	WMA_A_AX	OMEP	2007-2013	31	31	1400	64	I	A
299-E24-23	Near Field		ONBA	2007, 2008, 2009, 2012, 2013	6	6	290	99	D	None
299-E24-24	Near Field	IDF	ONBA	2007-2013	9	9	37	11	I	None
299-E24-33	Near Field	WMA_A_AX	OMEP	2007-2013	30	30	1500	500	V	A
299-E24-5	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-17	Near Field	216-A-37-1	OMEP	2009, 2010, 2011, 2012, 2013	5	4	200	60	I	BA
299-E25-18	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-19	Near Field	216-A-37-1	OMEP	2009, 2010, 2011, 2012, 2013	5	5	95	19	I	BA

Table A3-6. Well Network Analysis and Sampling Frequency Determination for Technium-99 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (900 pCi/L = DWS)	Min Concentration pCi/L (900 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E25-2	Near Field	WMA_A_AX	OBD	2007-2013	29	29	190	26.5	V	A
299-E25-20	Near Field	216-A-37-1	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-22	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-26	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-28	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-29P	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-29Q	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-3	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-32P	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-32Q	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-34	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-35	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-36	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-37	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-39	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-40	Near Field	WMA_A_AX	OBD	2007-2013	33	26	30	9.3	V	BA
299-E25-41	Near Field	WMA_A_AX	OBD	2007-2013	29	29	840	210	I	A
299-E25-42	Near Field		OMEP	2007-2013	7	7	120	24.8	V	BA
299-E25-43	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None

Table A3-6. Well Network Analysis and Sampling Frequency Determination for Technium-99 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (900 pCi/L = DWS)	Min Concentration pCi/L (900 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
299-E25-44	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-47	Near Field	216-A-37-1	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-48	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-6	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E25-93	Near Field	WMA_A_AX	IBD	2007-2013	29	29	8,000	650	D	A
299-E25-94	Near Field	WMA_A_AX	OBD	2007-2013	29	29	1,000	190	V	A
299-E26-4	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
299-E26-12	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
299-E26-13	Near Field	216-A-29	ONBA	no data	no data	no data	no data	no data	NA	None
499-S0-7	Far Field	FFTF	ONBA	2009, 2010, 2012	5	0	non-detect	non-detect	S	None
499-S0-8	Far Field	FFTF	ONBA	2009, 2010, 2012	5	1	24	24	V	None
499-S1-8J	Far Field	FFTF	ONBA	2007, 2008, 2009, 2010, 2012	8	0	non-detect	non-detect	S	None
699-10-54A	Far Field		ONBA	2007, 2008, 2010	5	1	50	50	V	None
699-10-E12	Far Field		ONBA	2008, 2011	2	2	20	13	D	None
699-14-38	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-17-5	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-19-43	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-20-20	Far Field		ONBA	2010	3	3	45	40	S	None

Table A3-6. Well Network Analysis and Sampling Frequency Determination for Technium-99 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (900 pCi/L = DWS)	Min Concentration pCi/L (900 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-20-E120	Far Field		ONBA	2008	1	0	non-detect	non-detect	NA	None
699-20-E12S	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-20-E5A	Far Field		ONBA	2010	4	4	98	65	I	None
699-21-6	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-22-35	Far Field	SWL	ONBA	no data	no data	no data	no data	no data	NA	None
699-2-3	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-24-46	Far Field		ONBA	2008	1	0	non-detect	non-detect	S	None
699-26-15A	Far Field		ONBA	2010	3	3	70	63	S	None
699-26-33	Far Field	NRDWL	ONBA	2008, 2009, 2012	3	3	20.5	17	S	None
699-26-35A	Far Field	NRDWL/SWL	ONBA	no data	no data	no data	no data	no data	NA	None
699-2-6A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-2-7	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-28-40	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-29-4	Far Field		ONBA	2010	3	3	120	110	D	None
699-31-11	Far Field		ONBA	2010	3	3	97	86	D	None
699-31-31	Far Field		ONBA	2009	1	0	non-detect	non-detect	S	None
699-32-22A	Far Field		ONBA	2008, 2010	5	5	43	33	I	None
699-32-43	Far Field		ONBA	2008	1	1	22	22	NA	None
699-33-56	Far Field		ONBA	2008	1	0	non-detect	non-detect	NA	None

Table A3-6. Well Network Analysis and Sampling Frequency Determination for Technium-99 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (900 pCi/L = DWS)	Min Concentration pCi/L (900 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-34-41B	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-34-42	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-35-9	Far Field		ONBA	2010	3	3	130	120	S	None
699-37-43	Near Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-37-47A	Near Field		OBD	2009, 2010, 2011, 2012, 2013	5	5	340	130	I	T
699-37-E4	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-38-15	Far Field		ONBA	2010	3	3	85	71	I	None
699-39-39	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-40-1	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-40-33A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-40-36	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-41-1A	Far Field		ONBA	2008, 2013	2	2	110	89	D	None
699-41-23	Far Field		ONBA	2007, 2008, 2010	5	1	6.7	6.7	V	None
699-41-40	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None
699-41-42	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-42-12A	Far Field		ONBA	2010	3	3	38	30	I	None
699-42-39A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-42-39B	Far Field	Ringold Confined	ONBA	no data	no data	no data	no data	no data	NA	None

Table A3-6. Well Network Analysis and Sampling Frequency Determination for Technium-99 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (900 pCi/L = DWS)	Min Concentration pCi/L (900 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-42-42B	Far Field	216-B-3/Ringold Confined	ONBA	2011, 2012	2	0	non-detect	non-detect	S	None
699-43-3	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-43-44	Near Field	B Pond	ONBA	2011, 2012	2	0	non-detect	non-detect	S	None
699-43-45	Near Field	216-A-29/216-B-3	ONBA	2011, 2012	2	0	non-detect	non-detect	S	None
699-46-21B	Far Field		ONBA	2007, 2008, 2010	5	2	11	6.9	V	None
699-46-4	Far Field		ONBA	2008, 2013	2	1	87	87	V	None
699-47-5	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-48-7A	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-49-13E	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-52-19	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-8-17	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-8-25	Far Field		ONBA	2010	3	0	non-detect	non-detect	S	None
699-9-E2	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S12-3	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S19E13	Far Field		ONBA	2008	1	1	20	20	NA	None
699-S19E14	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None
699-S3-25	Far Field		ONBA	2010	3	0	non-detect	non-detect	NA	None
699-S3-E12	Far Field		ONBA	2008	1	0	non-detect	non-detect	NA	None

Table A3-6. Well Network Analysis and Sampling Frequency Determination for Technium-99 Groundwater Monitoring

Well Name	Area	Associated RCRA Unit, Waste Site, Other Aquifer, or Monitoring Component	Well Grouping Category (Analysis for 2012 Plume)	Specific Years Sampled from 2007-2013 (Individual Years Listed)	Number of Analyses	Number of Detections (>MDL)	Max Concentration pCi/L (900 pCi/L = DWS)	Min Concentration pCi/L (900 pCi/L = DWS)	Concentration Trending Increasing (I), Decreasing (D), Stable (S), Variable (V)	Selected Sampling Frequency
699-S6-E14A	Far Field		ONBA	2009	1	0	non-detect	non-detect	NA	None
699-S8-19	Far Field		ONBA	no data	no data	no data	no data	no data	NA	None

Note: Maximum values exceeding the DWS are bolded.

Drinking Water Standard (DWS)

Fast Flux Test Facility (FFTF)

Inside Plume-monitoring concentration gradients (IMCG)

Inside Plume-boundary definition (IBD)

Integrated Disposal Facility (IDF)

Method Detection Limit (MDL)

Not Available (NA)

Nonradioactive Dangerous Waste Landfill (NRDWL)

Outside Plume-boundary definition (OBD)

Outside Plume-monitoring encroaching plume (OMEPE)

Outside Plume-non-boundary area (ONBA)

Outside Plume-monitoring potential source area (OMPSA)

Resource Conservation and Recovery Act of 1976 (RCRA)

Solid Waste Landfill (SWL)

Waste Management Area (WMA)

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Appendix B

Sampling Interval Information for 200-PO-1 Groundwater Operable Unit Wells

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B1 Introduction

This appendix provides the following information for the 200-PO-1 Groundwater Operable Unit wells.

- Well name
- Zone – the portion of the aquifer screened or open by perforated casing (Table B1-1)
- Sampling interval information for wells within the 200-PO-1 Groundwater Operable Unit Area is shown in Table B1-2
- Elevation at top of the screen or perforated interval
- Elevation at the bottom of the screen or perforated interval
- Open interval = Length of the open interval, difference between elevations of top and bottom of the screen or perforated interval
- Water Level Elevation = Most recent water level elevation in the well
- Water Level Date = Date of most recent water level elevation measured in the well
- NA = Information not available

Table B1-1. Relative Monitoring Zone Classification Scheme

Zone	Description
U	(Undifferentiated unconfined) Open to more than 15.2 m (50 ft) of the unconfined aquifer system, or the open/monitoring interval depth is not documented but is known to be within the unconfined aquifer system.
TU	(Top of unconfined) Screened across the water table or the top of the open interval is within 1.5 m (5 ft) of the water table, and the bottom of the open interval is no more than 10.7 m (35 ft) below the water table.
UU	(Upper unconfined) The top of the open interval is more than 1.5 m (5 ft) below the water table and the bottom of the open interval is no more than 15.2 m (50 ft) below the water table.
MU	(Middle unconfined) Open interval begins at greater than 15.2 m (50 ft) below the water table and does not extend below the middle coarse hydrogeologic unit or to within 15.2 m (50 ft) of the top of basalt.
LU	(Lower unconfined) Open interval begins at greater than 15.2 m (50 ft) below the water table and below the middle coarse hydrogeologic unit or within 15.2 m (50 ft) of the top of basalt and does not extend more than 3 m (10 ft) below the top of basalt.
CR	(Confined Ringold) Artesian wells for which the open interval does not extend more than 3.0 m (10 ft) below the top of basalt. Typically open to the lower mud and basal coarse hydrogeologic units of the Ringold Formation.

Table B1-2. Sampling Interval Information for Wells within the 200-PO-1 Groundwater Operable Unit Area

Well or Aquifer Tube Name	Zone	Elevation Top of Interval (m NAVD88)	Elevation Bottom of Interval (m NAVD88)	Open Interval (m)	Water Level (m NAVD88)	Water Level Date
299-E13-11	TU	125.49	114.82	10.67	121.814	10/1/2013
299-E13-14	TU	130.09	120.03	10.06	121.867	7/31/2013
299-E13-19	TU	128.56	113.32	15.24	121.884	6/13/2013
299-E13-5	TU	126.9	116.23	10.67	121.846	3/13/2013
299-E16-2	TU	127.82	106.18	21.64	121.655	3/13/2013
299-E17-1	TU	127.23	118.08	9.15	121.65	10/24/2013
299-E17-12	TU	123.64	117.24	6.4	121.745	2/19/2013
299-E17-13	TU	123.61	117.51	6.10	121.781	2/20/2013
299-E17-14	TU	125.8	119.7	6.1	121.723	2/27/2014
299-E17-16	TU	125.86	119.46	6.40	121.677	1/16/2014
299-E17-18	TU	124.75	118.35	6.4	121.713	2/27/2014
299-E17-19	TU	126.8	120.71	6.09	121.559	1/20/2014
299-E17-21	TU	125.27	116.17	9.10	121.67	2/19/2014
299-E17-22	TU	122.55	111.87	10.68	121.743	2/19/2014
299-E17-23	TU	122.35	111.95	10.40	121.743	2/19/2014
299-E17-25	TU	123.20	112.53	10.67	121.762	2/19/2014
299-E17-26	TU	121.39	110.73	10.66	122.253	1/21/2014
299-E18-1	TU	125.31	119.21	6.1	121.758	1/23/2014
299-E23-1	TU	122.8	112.8	10	121.751	2/20/2014
299-E24-16	TU	125.55	119.45	6.1	121.768	2/19/2014
299-E24-18	TU	125.9	117.94	7.96	121.746	2/19/2014
299-E24-20	TU	125.07	118.67	6.4	121.796	12/23/2013
299-E24-21	TU	122.69	116.6	6.1	121.751	2/19/2014
299-E24-22	UU	122.32	111.64	10.68	121.764	2/20/2014
299-E24-23	TU	122.1	111.43	10.67	121.837	12/17/2013
299-E24-24	TU	122.54	111.87	10.67	121.751	2/19/2014
299-E24-33	UU	121.27	111.51	9.76	121.763	2/20/2014
299-E24-5	TU	129.38	113.22	16.15	121.775	5/22/2013

Table B1-2. Sampling Interval Information for Wells within the 200-PO-1 Groundwater Operable Unit Area

Well or Aquifer Tube Name	Zone	Elevation Top of Interval (m NAVD88)	Elevation Bottom of Interval (m NAVD88)	Open Interval (m)	Water Level (m NAVD88)	Water Level Date
299-E25-17	TU	123.45	116.74	6.71	121.713	1/23/2014
299-E25-18	TU	125.37	117.75	7.62	121.78	3/13/2013
299-E25-19	TU	108.96	102.87	6.09	121.69	2/20/2014
299-E25-2	UU	121.83	109.64	12.19	121.743	12/19/2013
299-E25-20	TU	124.51	116.89	7.62	121.657	1/23/2014
299-E25-22	TU	125.02	115.88	9.14	121.56	4/16/2013
299-E25-26	UU	122.53	116.43	6.1	121.755	10/2/2013
299-E25-28	LU	104.8	96.2	8.6	121.755	10/25/2013
299-E25-29P	TU	129.17	115.45	13.72	121.842	7/6/2011
299-E25-29Q	MU	108.07	105.33	2.74	No data	--
299-E25-3	TU	127.24	114.44	12.80	121.805	3/13/2013
299-E25-32P	TU	127.5	115.71	11.79	121.545	10/10/2013
299-E25-32Q	LU	109.54	101.15	8.38	No data	--
299-E25-34	TU	125.63	118.2	7.43	121.696	2/20/2014
299-E25-35	TU	126.05	119.95	6.1	121.744	2/20/2014
299-E25-36	TU	125.29	118.89	6.4	121.748	2/20/2014
299-E25-37	TU	126.18	119.87	6.31	121.703	6/18/2013
299-E25-39	TU	126.31	120.13	6.18	121.97	9/29/2008
299-E25-40	TU	126.3	119.9	6.4	121.737	12/19/2013
299-E25-41	TU	127.01	120.6	6.41	121.735	12/19/2013
299-E25-42	TU	126.55	120.15	6.4	121.799	12/17/2013
299-E25-43	TU	125.46	119.06	6.40	121.778	6/12/2013
299-E25-44	TU	125.04	118.94	6.1	121.777	6/18/2013
299-E25-47	TU	125.19	119.04	6.16	121.771	7/15/2013
299-E25-48	TU	124.67	118.27	6.4	121.755	10/2/2013
299-E25-6	TU	130.73	114.27	16.46	120.815	2/19/2013
299-E25-93	UU	122.47	111.79	10.68	121.752	2/20/2014
299-E25-94	UU	121.36	110.7	10.66	121.818	12/23/2013

Table B1-2. Sampling Interval Information for Wells within the 200-PO-1 Groundwater Operable Unit Area

Well or Aquifer Tube Name	Zone	Elevation Top of Interval (m NAVD88)	Elevation Bottom of Interval (m NAVD88)	Open Interval (m)	Water Level (m NAVD88)	Water Level Date
299-E26-12	TU	125.81	119.41	6.4	121.796	10/25/2013
299-E26-13	TU	125.9	119.8	6.1	121.704	2/20/2014
299-E26-4	TU	129.38	112.31	17.07	121.752	2/20/2014
499-S0-7	MU	100.85	47.51	53.34	No data	--
499-S0-8	MU	110.39	82.05	28.35	No data	--
499-S1-8J	LU	58.94	49.79	9.15	No data	--
699-10-54A	UU	126.01	119.92	6.09	126.638	4/23/2013
699-10-E12	TU	114.04	28.69	85.34	109.282	1/6/2014
699-14-38	UU	123.44	106.68	16.76	123.639	3/18/2013
699-17-5	TU	119.2	115.84	3.36	117.285	4/11/2013
699-19-43	UU	137.65	111.75	25.9	122.134	3/21/2013
699-20-20	TU	122.1	106.86	15.24	121.095	1/8/2014
699-20-E12O	TU	109.96	103.87	6.096	109.453	1/6/2014
699-20-E12S	MU	113.58	28.54	85.04	109.52	4/2/2012
699-20-E5A	TU	114.17	112.64	1.53	113.164	3/21/2013
699-21-6	TU	120.59	114.19	6.4	118.082	3/20/2013
699-22-35	TU	125.71	115.04	10.67	121.589	1/27/2014
699-2-3	TU	119.46	107.88	11.58	118.052	3/20/2013
699-24-46	TU	125.34	-24.02	149.36	122.132	2/24/2014
699-26-15A	TU	124.71	28.39	96.32	120.455	3/13/2013
699-26-33	TU	125.9	119.8	6.1	121.62	8/27/2013
699-26-35A	TU	128.22	119.99	8.23	121.604	1/28/2014
699-2-6A	TU	120.76	114.66	6.10	118.859	10/22/2013
699-2-7	U	111.92	105.83	6.09	118.865	10/22/2013
699-28-40	TU	124.83	73.01	51.82	121.915	4/19/2012
699-29-4	TU	119.68	114.8	4.88	116.234	3/21/2013
699-31-11	U	91.85	76.58	15.27	118.392	3/20/2013
699-31-31	TU	120.22	76.02	44.2	121.573	1/29/2014

Table B1-2. Sampling Interval Information for Wells within the 200-PO-1 Groundwater Operable Unit Area

Well or Aquifer Tube Name	Zone	Elevation Top of Interval (m NAVD88)	Elevation Bottom of Interval (m NAVD88)	Open Interval (m)	Water Level (m NAVD88)	Water Level Date
699-32-22A	TU	123.94	106.26	17.68	120.964	10/22/2013
699-32-43	TU	123.98	120.93	3.05	121.746	3/21/2013
699-33-56	TU	122.56	93.9	28.66	122.059	3/26/2013
699-34-41B	TU	128.31	120.69	7.62	121.751	3/21/2013
699-34-42	TU	128.16	121.46	6.71	121.763	1/14/2013
699-35-9	TU	118.84	111.22	7.62	116.581	9/23/2013
699-37-43	TU	126.54	59.48	67.06	121.749	3/21/2013
699-37-47A	TU	124.56	115.42	9.14	121.716	2/19/2014
699-37-E4	MU	92.97	88.40	4.57	110.22	1/31/2013
699-38-15	TU	120.36	114.27	6.09	119.105	3/20/2013
699-39-39	CR	131.04	105.44	25.60	123.985	6/12/2013
699-40-1	TU	113.89	66.65	47.24	111.3	3/1/2013
699-40-33A	UU	126.1	101.54	24.56	123.901	3/13/2013
699-40-36	CR	97.59	94.23	3.36	123.767	3/12/2013
699-41-1A	TU	111.899	105.29	6.614	110.392	12/31/2013
699-41-23	TU	122.89	118.32	4.57	120.41	3/20/2013
699-41-40	CR	116.5	113.45	3.05	123.078	7/22/2013
699-41-42	MU	113.80	110.74	3.06	122.381	7/29/2013
699-42-12A	TU	126	59.24	66.76	114.295	3/18/2013
699-42-39A	MU	118.81	115.64	3.17	123.545	1/18/2013
699-42-39B	CR	108.27	104.92	3.35	123.498	3/12/2013
699-42-42B	CR	121.94	115.54	6.4	122.264	1/30/2014
699-43-3	UU	109.09	102.24	6.86	110.325	1/31/2013
699-43-44	TU	124.25	118.15	6.1	121.977	1/30/2014
699-43-45	TU	126.47	120.37	6.1	121.781	1/30/2014
699-46-21B	TU	120.17	92.13	28.04	118.594	3/21/2013
699-46-4	TU	110.56	103.55	7.01	109.351	12/31/2013
699-47-5	TU	111.11	104.10	7.01	110.75	1/25/2013

Table B1-2. Sampling Interval Information for Wells within the 200-PO-1 Groundwater Operable Unit Area

Well or Aquifer Tube Name	Zone	Elevation Top of Interval (m NAVD88)	Elevation Bottom of Interval (m NAVD88)	Open Interval (m)	Water Level (m NAVD88)	Water Level Date
699-48-7A	TU	114.06	107.96	6.10	110.768	1/18/2013
699-49-13E	UU	109.07	102.97	6.1	111.056	5/7/2013
699-52-19	TU	110.07	97.88	12.19	111.21	3/1/2013
699-8-17	TU	127.88	110.5	17.38	120.664	3/14/2013
699-8-25	TU	123.85	106.48	17.37	121.022	3/18/2013
699-9-E2	TU	123.62	50.47	73.15	113.627	4/11/2013
699-S12-3	TU	111.4	99.2	12.2	DRY	3/19/2013
699-S19-E13	TU	105.02	95.88	9.14	105.576	1/7/2014
699-S19-E14	TU	108.31	101.91	6.4	105.448	3/1/2013
699-S3-25	UU	124.86	107.19	17.67	121.258	3/21/2013
699-S3-E12	TU	110.63	60.34	50.29	108.524	1/6/2014
699-S6-E14A	TU	109.23	57.41	51.82	107.69	3/1/2013
699-S8-19	TU	121.92	113.39	8.53	120.879	6/4/2013

B2 Reference

NAVD88, 1988, *North American Vertical Datum of 1988*, National Geodetic Survey, Federal Geodetic Control Committee, Silver Spring, Maryland. Available at: <http://www.ngs.noaa.gov/>.

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